

LIBRARY OF THE





Digitized by the Internet Archive
in 2017 with funding from
IMLS LG-70-15-0138-15

<https://archive.org/details/asbbulletin2629asso>

59. 06

QH301
.A78
*

ISSN 0001-2080

The ASB

BULLETIN

Volume 26, Number 1

January 1979



JANUARY

FEB 20 1979

A. M. N. H.

CAMPUS SCENE, UT/CHATTANOOGA

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. Gary E. Dillard, Editor, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, Ms. 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pa. 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, Al. 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

GARY E. DILLARD

EDITOR

JERRY M. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — Raymond O. Flagg, Carolina Biological Supply Co., Burlington, N.C. 27215

Retiring President — Madeline P. Burbanck, Emory University, Atlanta, Ga. 30333

President Elect — James W. Hardin, NC State University, Raleigh, N.C. 27607

Vice-President — Beryl C. Franklin, Northeast Louisiana State University, Monroe, La. 71201

Secretary — Jerry M. Baskin, University of Kentucky, Lexington, Ky. 40506

Treasurer — J. C. O'Kelley, University of Alabama, University, Al. 35486

Archivist — Madeline P. Burbanck

Executive Committee —

J. Frank McCormick (1979), University of Tennessee

Rudolph Prins (1979), Western Kentucky University

Jon R. Fortman (1980), Mississippi University for Women

George M. Simmons, Jr. (1980), VPI & SU

Fr. John H. Mullahy†, Loyola University of the South

Linda M. Stroud (1981), East Carolina University

AAAS Representative, Section G —

Franklin F. Flint (1978-81)

AIBS Representative —

John M. Herr, Jr. (1978)

†Deceased



CONTENTS

About the Chattanooga Meeting	3
News of Biology in the Southeast	7

TIME AND PLACE OF FUTURE MEETINGS

1980 April 23-26 University of South Florida, Tampa

1981 University of Tennessee, Knoxville

1982 Eastern Kentucky University, Richmond

PATRONS

Carolina Biological Supply Company; Burlington, NC

Parco Scientific Company; Vienna, OH

Scientific Products; Atlanta, GA

BUSINESS AFFILIATE

Olinkraft, Incorporated; West Monroe, LA

COPY DEADLINES

April Issue: January 1

July Issue: May 15

October Issue: August 15

January Issue: November 15

ABOUT THE CHATTANOOGA MEETING

The Association of Southeastern Biologists will hold its 40th Annual Meeting April 25-28, 1979, at The University of Tennessee in Chattanooga. Registration, exhibits, Thursday night smoker, Friday night banquet, Retiring President's address, presentation of awards and new officers and other activities will be in the *University Center*.

The University of Tennessee extends a friendly invitation to all to attend the meetings and to visit the area and campus.

Societies Meeting With ASB

Beta Beta Beta, Southeastern Region
Southeastern Division, American Society of
Ichthyologists and Herpetologists
Southeastern Fishes Council
Southeastern Section, Botanical Society of
America
Southeastern Chapter, Ecological Society of
America
Southeastern Society of Parasitologists
Southern Appalachian Botanical Club

Chattanooga And The University Of Tennessee At Chattanooga

Chattanooga lies in the valley below Lookout and Signal Mountains where the Tennessee River forms Moccasin Bend. Upstream is Chickamauga Dam and its 35,000 acre lake and downstream is the Grand Canyon of the Tennessee which opens into Nickajack Lake, the newest lake of the T.V.A.

Chattanooga Country is a city of 170,000 in a metropolitan area of 400,000 with wide ranging light and heavy industry combined with the surrounding environs of scenic and historic significance that makes tourism an important part of its economy.

The University of Tennessee at Chattanooga was formed in 1969 when the University of Chattanooga and a junior college, Chattanooga City College, merged to become a major campus of The University of Tennessee. The University of Chattanooga was founded as a private school in

1886 and until 1907 was affiliated with the Methodist-Episcopal Church.

The University is located only a few blocks from downtown Chattanooga. Its wide diversity of degree programs has attracted an enrollment of over 7,000 students. Students interested in the biological sciences may take their majors in Biology (B.A.), Secondary Education — Biology (B.S.), Environmental Studies — Biology (B.S.) or Medical Technology (B.S.). The faculty of the Biology Department consists of 12 members, each holding Ph.D. degrees from different institutions. The Department is housed in Holt Hall, the newest classroom building on the campus.

Travel Into Chattanooga

AUTOMOBILE: Various highways enter Chattanooga from all parts of the south, the major one being I-75. All entering highways ultimately converge on I-24 which merges into I-124 in the downtown area. The following directions will lead you to the *University Center* on the campus which is where all guests are expected to register.

Entering on I-75, take the I-24 turnoff west toward downtown Chattanooga. Highway I-124 will split to the right from I-24 shortly before entering the vicinity of downtown Chattanooga, if traveling from the north or east, otherwise it will split to the left if traveling from the west or southwest (Nashville, Birmingham). From I-124 take the 4th Street off ramp toward the right (east). Stay on 4th past Chestnut, Broad and Market Streets beyond which 4th becomes a one-way thoroughfare. Stay on 4th after crossing Market for approximately 1.1 miles to *Mabel Street*. Turn right onto Mabel. You should now be heading approximately south and be very near the University.

Shortly after turning right onto Mabel, the road forks — left into 5th St., and right into *Douglas Street* (for some strange reason, Mabel ceases to exist at this point). Bear right onto Douglas. The first stop sign after the

fork is *Vine*, a one-way street. You are now at the west end of the campus. Turn left onto Vine Street.

Signs will direct you to parking areas and the *University Center*, both of which are only a short distance from the turn onto Vine St.

AIR SERVICE: Regularly scheduled flights by Eastern, Delta, United and Southern Airlines.

RAILWAY PASSENGER SERVICE: No passenger train serves Chattanooga.

BUS SERVICE: Greyhound and Trailways.

TRAVEL FROM AIRPORT/BUS TERMINALS

TO HOTELS: Travel from the airport to your hotel via limousine is available in some cases, but you should be aware that not all hotels offer it, and in cases where it is available, you must give advance notice that it will be required. If you are planning to travel into Chattanooga by air, it is suggested that you check with the hotel with which you have booked your rooms as to accessibility of surface transportation. This is absolutely essential since taxis seldom are on hand unless specifically requested. Car rental at the airport is readily available and all agencies furnish complete instructions and road maps of the city upon request.

The bus terminal in Chattanooga is in the downtown area within a very few blocks of the hotels. Taxi arrangements may be made by phone in advance or upon arrival.

Dining Facilities

The *University Center* has a cafeteria. The City of Chattanooga has many restaurants, some of which are near the campus. A list will be provided at Registration.

Local Alcohol Mores

Alcoholic beverages are served in most restaurants weekdays until 12 P.M. Beer, mixes and other party needs are available in grocery stores; other alcoholic beverages are available at privately-owned liquor stores in the area.

Accommodations

No campus housing is available. It is advisable to make motel reservations several weeks

prior to the meeting since April is a busy month for conventions in Chattanooga. Make your reservations by writing or calling the motel of your choice.

The following five motels have reserved rooms for ASB members. They require a minimum of two weeks notice for reservations except for the Holiday Inn, which requires three weeks notice. Please mention that you are a member of ASB when making your reservation. All of these downtown area motels, except the Chattanooga Choo Choo Hilton, are approximately one mile from the campus.

— Chattanooga Choo Choo Hilton — 1400 Market St.

(1-800-446-3811), 1979 rates:

Single \$30-40, Double \$38-48.

— Choo Choo Read House — 9th and Broad Sts.

(1-800-251-6443), 1978 rates:

Single \$28-34, Double \$36-48.

— Downtowner Motor Inn — 9th and Carter Sts.

(1-615-266-7331), 1978 rates:

Single \$17, Double \$28.

— Holiday Inn — 401 W. 9th St.

(1-800-323-9050), 1978 rates:

Single \$20, Double \$28.50.

— Sheraton Hotel — 407 Chestnut St.

(1-800-325-3535), 1978 rates:

Single \$22-26, Double \$26-31.

The following motels have not reserved rooms for ASB members but are only a few miles from campus.

— Admiral Benbow Inn — I-24 at Market St.

(1-800-323-3900), 1978 rates:

Single \$17-21, Double \$34.

— Howard Johnson Motor Lodge — 100 W. 21st St.

(1-800-654-2000), 1978 rates:

Single \$18, Double \$26.

— Ramada Inn — I-24, 4th Ave. Exit

(1-800-228-2828), 1978 rates:

Single \$18-20, Double \$25.

— Quality Inn South — I-75 at East Ridge Exit.
(1-800-228-5151). 1978 rates:
Single \$21, Double \$24-28.
This motel is about 5 miles from campus but near the freeway.

Camping facilities: rates are for 1978 and do not include various hookups or trailer charges.

— Booker T. Washington State Park, off hwy. 58 N, 5 miles N.E. of city
(1-615-894-4955), \$4.00.

— Harrison Bay State Park, off hwy. 58 N, 15 miles N.E. of city
(1-615-344-6214), \$4.00.

— Holiday Inn Trav-L-Park, on Mack Smith Rd., ½ mile off I-75 at East Ridge Exit
(1-615-891-9766), \$6.00.

— Kampgrounds of America, near Chickamauga National Park, I-75 at Ga. 2
(1-404-937-4166), \$5.-6.50.

Registration

First floor of *Student Center*, 6-9 P.M. Wednesday, 8 A.M. - 7 P.M. Thursday, 8 A.M. to 11 A.M. Friday. Students \$3.00, others \$5.00.

General Schedule

Thursday: Paper Sessions: morning and afternoon.

Business Meetings and Luncheons: University Center.

Exhibits: 8-5, Chattanooga Room (North), University Center.

Placement Service: 8-5, Blue and Gold Rooms, University Center.

General Session: 7:30 P.M., Room 129 Grote Hall.

Smoker: 9-11 P.M. Dining Area, University Center.

Friday: Paper Sessions: morning and afternoon.

Botanical Society and Southern Appalachian Botanical Club Business Meeting and Breakfast: 7:15 A.M., Chattanooga Room (South), University Center.

Exhibits: 8-Noon, Chattanooga Room (North), University Center.

Placement Service: 8-5, Blue and Gold Rooms, University Center.

ASB Business Meeting: 11:00-12:00.

Banquet: 7 P.M., Chattanooga Room, University Center.

Retiring President's Address

Madeline P. Burbanck

Emory University

Saturday: Executive Committee Breakfast and Meeting — 8:30 A.M.

Field Trips — Meet in parking lot behind the Biology Building next to the greenhouse.

Local Points Of Interest

A. Campus

1. "Biology in Art," located in Holt Hall, 1st floor foyer, is an exhibit by artist Bruce Bobick and is available for viewing throughout the ASB meeting.
2. Senior Art Show, located in the Art Building behind Brock Hall, includes the works of finishing undergraduate students.

B. Chattanooga Area

1. Point Park, Lookout Mountain, provides on a clear day an excellent view of Chattanooga, Moccasin Bend of the Tennessee River, and general environs. Ochs Museum provides a historical narrative of the Civil War's "Battle Above the Clouds." The Park is administered by the National Park Service and admission is free. The Park may be reached by following directional signs as one drives up Lookout Mountain. One approach to Point Park is to drive to the foot of Lookout Mountain, ride the Incline Railroad to the top of the mountain, and walk the two short blocks to the entrance of the Park.
2. Chattanooga Choo-Choo, located at 1400 Market Street, is south of the downtown business section and is a remodeled depot

of the Southern Railroad. As a convention and commercial center, it provides hotel accommodations (including converted railroad coaches), dining facilities, night entertainment, arts and crafts shops, bookstore, operating trolley car (10¢ per ride; conductors often are railroad buffs who are very knowledgeable about railroading), model railroad museum. Admission: about \$1.00.

3. Houston Antique Museum, located at 201 High Street near the Hunter Museum of Art, has a collection of glass antiques. Admission is charged.
4. Hunter Museum of Art, located at 10 Bluff View and overlooking the Tennessee River from high above the south bank, combines traditional and contemporary architecture. The Museum has permanent and changing exhibits. Admission: Donation requested.
5. Tennessee Valley Railroad Museum, located at 2202 N. Chamberlain Avenue, opens annually in mid-to-late-April. It has a functional steam-powered locomotive that provides a train ride over a three and one-half mile track with one tunnel and three bridges. Admission is charged.
6. Rock City Gardens, located atop Lookout Mountain, is a network of paths through crevasses, open areas, and precipices that terminate in a fantasyland of nursery rhymes. Admission: \$3.50.
7. Plum Nelly Shop and Gallery, 1201 Hixson Pike, is one example of several shops in Chattanooga that emphasize arts and crafts of the Southern Appalachians and Southern artisans.
8. Reflection Riding, located off I-24 and west of Chattanooga, offers an array of spring flora, mainly wildflowers, that may be viewed from a car. Admission charge: about \$1.00 per vehicle.

Field Trips

1. **COPPER BASIN.** Denuded by a combination of logging, mining, and copper smelting

processes in the late 19th and early 20th centuries, the Copper Basin remains in many places a barren landscape subject to the physical forces of nature. Reclamation attempts are in progress. Located approximately 60 miles east of Chattanooga and along the Tennessee-Georgia border, the Copper Basin trip should require approximately ¾ day.

2. **BOTANICAL TOUR OF CHICKAMAUGA AND CHATTANOOGA NATIONAL PARK.** An introduction to the local flora of the Chattanooga-North Georgia area, including a local limestone-cedar glade, will be available in the National Military Park. Dr. Gene Van Horn has compiled a floristic list of the Park and will conduct the tour. Approximately ½ day.
3. **COMMERCIAL ORCHID GREENHOUSES.** Orchid culture and hybridization by commercial producers may be seen. Approximately ½ day.

Local Arrangements Committee

Chairperson — B. Franke

Registration — C. Nelson

Program/Meeting Rooms — R. Garth*,

G. Van Horn, C. Nelson

Exhibits and Publicity — P. Perfetti

Field Trips — G. Litchford*, M. Edwards

Projection Equipment — G. Vredevel

Transportation and Parking — B. Walton*,
R. Durham

Housing — G. Van Horn

Placement Bureau — J. Freeman

*In Charge.



News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — James Wilkes, Troy State University

Florida — Vacant

Georgia — Fred K. Parrish, Georgia State University

Illinois — George T. Weaver, Southern Illinois University

Kentucky — Joe E. Winstead, Western Kentucky University

Louisiana — Harry J. Bennett, Louisiana State University

Maryland — Don Windler, Towson State University

Mississippi — James T. Murrell, Mississippi University for Women

North Carolina — Vacant

South Carolina — G. Thomas Riffin, Jr., Newberry College

Tennessee — John R. Freeman, University of Tennessee at Chattanooga

Virginia — Jean Pugh, Christopher Newport College

West Virginia — Roy B. Clarkson, West Virginia University

JON R. FORTMAN — *News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

About People

Auburn University, Department of Botany and Microbiology. Mrs. Vera K. Varner has joined the faculty as an Instructor with teaching responsibilities in general biology. The following grants have been awarded to faculty members: **Dr. W. T. Blevins**, "Mechanisms of Antibiotic Resistance in *Chromobacterium violaceum*"; **Dr. J. D. Freeman**, "Field Identification of Endangered and Threatened Plants of Alabama"; **Dr. G. Morgan-Jones**, "Ecology of Aquatic Hyphomycetes"; **Dr. C. M. Peterson**, "A Study of Heat Tolerance in Tomatoes"; **Dr. J. D. Weete**, "Wax Synthesis in Leaf Epidermis Tissue." **Dr. Blevins**, Associate Professor, was elected President-Elect of the Southeastern Branch of the American Society for Microbiologists at the annual meeting held in Tallahassee, November, 1978.

University of North Alabama, Department of Biology. **Dr. Paul Kittle** has been appointed Assistant Professor. An invertebrate zoologist, **Dr. Kittle** received his doctorate from the University of Arkansas. **Dr. Thomas H. Ely** has received a NSF grant for Instructional Scientific Equipment for physiology instruction.

University of Alabama-Huntsville, Department of Biology. Drs. Junius Clark and Zoe Evans have recently received a NSF Microbiology Program Improvement Grant.

The University of Alabama, Tuscaloosa, Department of Biology. Drs. Temd Deason and Harriett Smith have received \$66,400 from NSF toward the purchase of a second transmission electron microscope. With additional funding provided by The University of Alabama, a Zeiss EM 10A high resolution electron microscope has been acquired. **Dr. Robert Haynes** has also received funds from NSF for the purchase of equipment.

Emory University, Department of Biology. The following new appointments have been made: **Ann T. Dunlop** (Ph.D., State University of New York at Binghamton) as Assistant Professor; **Judith G. Morgan** (Ph.D., University of Texas at Austin) as Assistant Professor; **Donald Phillips** (Ph.D., Utah State University) as Assis-

tant Professor; **John Schalles** (M.S., Emory University) as Instructor. **Dr. Robert B. Platt**, Professor of Biology, retired from the Department on August 31, 1978. ASB members were saddened by the death of **Dr. Ernest L. Hunt**, Professor of Biology, who died July 9, 1978. Emory University faculty receiving grants are: **William Elmer**, "Studies on Early Normal and Abnormal Limb Development" and a grant from the Ninna-James Heine-man Foundation to study at the University of Glasgow from January, 1979 to July, 1979; **Victoria Finnerty**, "Regulation of Gene Expression in *Drosophila*" and "A New System for Screening Environmental Mutagens"; **A. A. Humphries, Jr.** was awarded a Senior Fellowship by NATO to support a visit with **Professor C. R. Austin** at Cambridge University and for lectures at the Université de Rennes, France, the Università di Pisa, Italy, and the Stazione Zoologica in Naples, Italy; **Harvey L. Ragsdale**, **William H. Murdy** and **D. J. Shure**, "Ecological Behavior and Effects of Energy-Related Pollutants"; **Harvey L. Ragsdale**, "Screening of Non-Commercial Woody Plants as Biomass Fuel Producers"; **Dennis Smith**, "Recombination Proficiency in *Drosophila melanogaster*" and "Environmental Mutagenesis and DNA Repair"; **Conrad Wickstrom**, "Ecology and Physiology of Nitrogen Fixation in Thermal Springs."

Agnes Scott College, Department of Biology. New additions to the faculty are **Dr. Paul Frame**, Assistant Professor, from the Brookhaven National Laboratory in New York and **M. Elsie Carter**, Instructor, from Emory University.

University of Florida, Department of Botany. **Dr. George Bowes** has received a Competitive Research Grant, Science and Education Administration, U.S.D.A., for support of "Variations in the Photosynthesis/Photorespiration of Aquatic Plants." He was also awarded a grant from the University of Florida Graduate School in support of his research. **Dr. Paul J. Ewel** has received a grant from NSF for a two-year investigation of "Natural Succession as a Model for the Design of New Tropical Agroecosystems" to be carried out in

Costa Rica. **Dr. Indra K. Vasil** has been awarded a Research Grant, Science and Education Administration, for support of his research on "Protoplast Culture and Regeneration in Tissue Cultures of Cereals." **Dr. Vasil** attended the NATO-Advanced Study Institute on Plant Growth Regulation and World Agriculture at Izmir, Turkey, this past September. He spoke on the subject "Somatic Hybridization and Genetic Modification in Plants."

Jacksonville University, Florida, Division of Science and Mathematics. **Dr. A. Quinton White** has been appointed Assistant Professor after two years as Visiting Assistant Professor.

The Florida State University, Department of Biological Sciences. Appointments include: **Kenneth H. Roux** (Ph.D., Tulane University), Assistant Professor and **Ruth M. Sadler** (Ph.D., Florida State University) Visiting Lecturer. Biological Science faculty members have received grants for 1978 totaling \$2,037,044.

Southern Illinois University, Carbondale. **George T. Weaver**, Associate Professor, **James S. Fralish**, Associate Professor, Department of Forestry, and **Stanley E. Harris, Jr.**, Professor, Department of Geology, have been awarded a contract by the Division of Natural Landmarks, Heritage Conservation and Recreation Service, to classify and inventory potential ecological and geological Natural Landmarks in the Eastern Lowlands of the United States.

Western Kentucky University, Department of Biology. **Mr. Blaine Ferrell** (Ph.D. Candidate, Louisiana State University) has joined the Department as an Instructor. **Dr. Ernest O. Beal**, Professor and Head of the Department since 1968, has retired and now serves as Adjunct Professor continuing his research on the systematics of aquatic vascular plants. **Dr. Gary E. Dillard** has been appointed Assistant Dean of the Graduate College effective January 1, 1979. **Dr. Larry Elliott** has received a grant from the Kentucky Health Education System in support of a clinical experience program for medical technology students. **Drs. Tom Coohill** and **F. D. Bryant**, assisted by **Ms. Sharon P. Moore**, have received a continuation grant from the FDA for research on the effects of UV on cells and viruses. **Dr. Robert D. Hoyt** has received grants from the U.S. Fish and Wildlife Service and from the National Oceanic and Atmospheric Administration and Kentucky Division of Fish and Wildlife Resources. The grants will support studies on the fishes of Barren, Green and Rough River Reservoirs below their dams and the controlled harvest of rough fishes from Rough River Reservoir, respectively. **Mr. Rodney McCurry** has received a grant from NSF in support of a Pre-College Teacher Development Program.

Louisiana Tech University, Department of Zoology. A new addition to the Department is **Dr. John M. Wakeman** (Ph.D., University of Texas, Austin), Assistant Professor.

Newcomb College, Tulane University. **Dr. Stuart S. Bamforth** is the new President of the Society of Protozoologists. **Dr. Leonard Thien** is conducting an extensive study of the Honey Island Swamp (Miss.-La. border) to describe the floristics and functioning before further disturbance of upstream communities change it.

Northeast Louisiana University, Department of Biology. **Dr. B. Earl Prince**, Professor of Biology, has retired after serving as Head of the Department since 1961. **Dr. Melinda L. Kinkade** has been named Head of the Department.

University of Southwestern Louisiana, Department of Biology. The State of Louisiana has awarded a grant to **Darryl L. Felder** for a feasibility study and planning program for a coastal marine research and education center to be located in coastal Louisiana.

Millsaps College, Department of Biology. **Dr. David Heins** (Ph.D., Tulane University) and **Dr. Micke Smith** from Virginia Polytechnic Institute have recently joined the Department.

Mississippi College, Department of Biological Sciences. **Dr. Prentiss G. Cox** will spend a sabbatical year in the Microbiology Department of the University of Mississippi School of Medicine working in the laboratory of **Dr. Benjamin R. Byers** studying iron transport and metabolism in eucaryotic cells, especially cardiac and skeletal muscle cells. **Dr. Byers'** research on cardiac cells is supported by a research grant from the Cooley's Anemia Foundation. The National Science Foundation has recently funded a five-year study of North American stonefly larvae. Co-principal investigators are **Dr. K. W. Stewart**, North Texas State University, and **Dr. B. P. Stark**, Mississippi College.

The University of Mississippi, Department of Biology. **Dr. Edmund D. Keiser**, Chairman and Professor, has been appointed to the newly-formed Mississippi Wildlife Conservation Commission by **Governor Cliff Finch**. This Commission, consisting of five persons, will organize, control and supervise the activities of the Mississippi Department of Wildlife Conservation. **Dr. Ronald A. Fritzsche**, Assistant Professor, has recently received word that his volume in a series dealing with the early life histories of fishes has been published by the Government Printing Office and is available from the Superintendent of Documents. **Dr. Fritzsche's** book is entitled "Development of Fishes of the Mid-Atlantic Bight. An Atlas of Egg, Larval and Juvenile Stages, Vol. V., Families Pomacentridae Through Ophidiidae."

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. **Mrs. Janet B. Mapp** has received a 1978 Student Research Award for an abstract of her studies in microbiology at the University of Southern Mississippi. The award was presented at the Eleventh Annual Sea Grant Association Meeting in Portsmouth, New Hampshire, by **Dr. James I. Jones** Director of the Mississippi-Alabama Sea Grant Consortium. **Mrs. Mapp's** abstract was entitled, "Virus Recovery from Contaminated Shell-

fish" and is a result of her master's thesis research at USM. **Dr. R. V. Krishnamoorthy**, Associate Professor of Zoology at the University of Agricultural Sciences at Bangalore, India, has spent the past year at the Gulf Coast Research Laboratory where he has been working on nutritional problems of shrimp and oysters from Mississippi waters. At GCRL he has been associated with **Dr. A. Venkataramiah**, **Dr. G. Lakshmi** and **Ms. Patricia Biesiot** of the Physiology Section. A contract has been received from the Environmental Protection Agency to conduct a project entitled "Toxicity Testing: Inter-Laboratory Comparison." **Dr. William W. Walker** is the principal investigator and **Dr. Adrian R. Lawler** is a co-investigator. **Dr. Thomas D. McIlwain** (Ph.D., University of Southern Mississippi) has been appointed Assistant Director for Fisheries Research and Management. He joined the GCRL staff in 1966 as a marine biologist. In September, work began on a new project entitled "Pilot Study for Menhaden Catch-Effort Log." **David Boyes**, head of the Computer Center will serve as project leader and **J. Y. Christmas**, senior fishery biologist, as assistant. Another contract has been signed with the U.S. Department of Energy to conduct a project entitled "Studies on Acute Toxicity of Ocean Thermal Energy Conversion Plant Components on Selected Marine Animals from the Gulf of Mexico." **Drs. A. Venkataramiah** and **Gordon Gunter** are co-principal investigators and will be assisted by **Dr. G. Lakshmi** and **Patricia Biesiot**.

Appalachian State University, Department of Biology. **Dr. F. Ray Derrick**, former Chairman and Professor, retired June 1, 1978, after 32 years of service. **Dr. R. Wayne Van Devender** has been appointed Assistant Professor and will teach herpetology and mammalogy. He comes from the University of Michigan where he was Curator of Amphibians at the University Museum.

East Carolina University, Department of Biology. **Dr. Charles B. McDonald** has been appointed Lecturer. He obtained his Ph.D. at North Carolina State University and served as Assistant Curator of the NCSU Herbarium. Recent grants to faculty are **Dr. Charles E. Bland**, matching funds for the purchase of a scanning electron microscope; **Dr. Donald B. Jeffreys**, an evaluation of *Rangia cuneata* as a food product for compliance with Public Health Standards to be conducted jointly with **Dr. Bernard E. Kane, Jr.** of the School of Allied Health and Social Professions; **Dr. Mark M. Brinson**, "Influence of Wetlands on the Metabolic and Nutritional Status of Downstream Aquatic Ecosystems."

Davidson College, Department of Biology. **Dr. William Wellnitz** (Ph.D., Cornell University) is a new member of the faculty. **Dr. Donald Kimmel** is on sabbatical investigating developmental neurology in spiders at Dorothea Dix Hospital in Raleigh, North Carolina.

North Carolina State University, Department of Botany. **Dr. J. W. Hardin** and **Mr. F. D. Watson** have a grant from the U.S. Forest Service to study the varia-

bility and taxonomy of *Taxodium* (cypress) throughout the eastern United States.

The College of Charleston, Department of Biology. Six biology faculty members and several graduate students are now completing research funded by a two-year grant from the Environmental Protection Agency. This research has involved a base-line investigation of an undisturbed salt marsh near Charleston, South Carolina. **Dr. Chris Koenig** has received a two-year grant from the EPA to evaluate the fish, *Rivulus marmoratus*, as a mutagen/carcinogen screening animal. **Dr. Mike Maddock** is investigating certain genetic aspects of the same species.

University of South Carolina, Department of Biology. **Dr. Duane C. Yoch** has been appointed Assistant Professor. He is a microbiologist with research interest in nitrogen fixation. Faculty grants include: **Dr. B. E. Ely**, "Cloning of the *Caulobacter crescentus* Genome" and "Analysis of Differentiation in *Caulobacter crescentus*"; **Dr. M. R. Felder**, "Regulation of Enzyme Levels in Mouse Hepatomas"; **Dr. S. N. Handel**, "Research Bibliography of the Congaree National Monument Area"; **Dr. A. H. C. Huang**, "Dynamic Aspects of Storage Protein Bodies"; **Dr. E. H. Liu**, "The Identification of Biologically Important Carbohydrate Binding Leitins"; **Dr. P. E. Mirkes**, "Regulation of mRNA Utilization and Control of Protein Synthesis During Fungal Development"; **Dr. N. C. Mishra**, "Genetics of DNA Repair in Eukaryotes"; **Dr. D. L. Rohlfing**, "Effect of Simulated Primordial Environmental Conditions on Models for Pre-Biotic Protein and Protocells"; **Dr. R. H. Sawyer**, "Epithelial-Mesenchymal Interactions"; **Dr. E. A. Thompson**, "Hormonal Control of Cellular Proliferation"; **Dr. M. H. Vodkin**, "Endogenous Viral-Related Genes in Fungal Genomes."

Benedict College, Department of Biology. **Dr. George McCoy** (Ph.D., Louisiana State University) has been appointed Assistant Professor.

The University of Tennessee, Botany Department. **Hal DeSelm** and **Michael Clark**, Department of Geological Sciences, have contracted with the Heritage Conservation and Recreation Service to search the Appalachian Ranges for potential National Natural Landmarks. **Drs. A. Murray Evans** and **B. Eugene Wofford** have received a grant from the U.S.D.A.-Forest Service to conduct an inventory of proposed threatened and endangered plant species of the Cherokee National Forest, Tennessee. **A. J. Sharp**, accompanied by four graduate students, **Brian Boom**, **Kenneth McFarland**, **Tom Patrick** and **Mark Whitten**, made a collecting trip into the Yucatan Peninsula and other areas of Mexico, July 26-August 25, 1978.

Austin Peay State University, Department of Biology. New appointments include **Dr. Anthony F. Scott**, Assistant Professor; **Mrs. Heidi Wetherall**, Assistant Professor and ASCP Medical Technologist; **Mr. Stephen**

Pasquale, Assistant Professor and ASCP Medical Technologist.

Southwestern at Memphis, Biology Department. Two new appointments are announced: **Dr. Ann H. Williams** (Ph.D., University of North Carolina, Chapel Hill) and **Dr. Terry Hill** (Ph.D., University of Florida).

James Madison University, Department of Bio'ogy. **Dr. Jean D. Acton** has been appointed Associate Professor, teaching courses in general microbiology, immunology and virology. **Dr. Acton** is also the recipient of a grant from the National Institute of Environmental Health Sciences to study the effect of nitrogen dioxide on pulmonary monocytes.

Old Dominion University, Department of Biological Sciences. Three new appointments were made to the Medical Technology faculty: **Faye Coleman**, **Pauline Lumsden** and **Thomas Somma**. **Dr. James C. Johnson** has received a grant from the Virginia Water Resources Program and is principal investigator on a NSF-ISEP grant. **Drs. Ray W. Alden** and **Daniel M. Dauer** have received a grant from NOAA to assess the ecological impact of open ocean disposal of materials from a highly industrialized estuary. **Dr. Harold G. Marshall** received a grant from the Virginia Environmental Endowment for research associated with the Virginia Barrier Islands system.

North Carolina State Museum of Natural History. The North Carolina State Museum has embarked on a two-year contract study of the distribution and ecology of the Neuse River waterdog, *Necturus lewisi*, an aquatic salamander endemic to the Neuse and Tar River drainages in North Carolina. **Ray E. Ashton, Jr.** is the principal investigator and **Alvin L. Braswell** the field coordinator. They will be assisted by **John E. Cooper**, **John B. Funderburg**, **William M. Palmer** and five field technicians.

Murray State University, Biology Department. **Drs. James B. Sickel** and **Donald W. Johnson** of the Hancock Biological Station, received a two-year grant from the National Marine Fisheries Service and the Kentucky Department of Fish and Wildlife Resources to investigate the commercial potential and ecology of the Asiatic clam and fish in the Kentucky portions of the Tennessee and Cumberland Rivers.

University of Tennessee, Knoxville, Zoology Department. **Dr. J. C. Daniel** has resigned as Head of the Department and has returned to teaching and research. The new Head is **Dr. J. C. Abel**, previously Professor of Zoology, Colorado State University. **Dr. Neil B. Greenberg** has joined the Department as an Assistant Professor. Three long-time University of Tennessee professors retired and entered emeritus status in 1978. They are **Drs. J. G. Carlson**, **J. C. Howell** and **A. W. Jones**. **Rosemary Hall**, a graduate student from New South Wales, Australia, has received a Rotary International Foundation Educational Award for studies in reproductive biology. She is working with **Dr. J. C. Daniel**.

About Institutions

Jacksonville University. A new marine science major has been instituted beginning 1978.

Appalachian State University. A new greenhouse has been added to the facilities of the Biology Department. **Ms. Betsy Cobb**, Horticulturist from Florida State University, is the Propagator.

Warren Wilson College, North Carolina. A program has been established with Duke University whereby students can attend Warren Wilson for three years in the area of Natural Resource Management and then transfer to the Duke School of Natural Resource Management for two years. At the end of this time, the student will receive an M.S. from Duke in either Forestry or Resource Management and a B.A. from Warren Wilson in Natural Resource Management.

North Carolina State University. The 20th Annual meeting of the Society for Economic Botany will meet at NCSU June 10-13, 1979. A symposium will be held on "Medicinal Plants — Past and Present." Contact **Dr. J. W. Hardin**, Department of Botany, for information.

Austin Peay State University. A new program in Medical Technology has been initiated with new courses in Hematology, Clinical Analysis, Immunology-Serology, Medical Microbiology and Urinalysis, and has established affiliations with four hospitals located in the Nashville area.

Southwestern at Memphis. A NSF matching grant has been received for the purchase of instruments used in the preparation of EM specimens.

James Madison University. A new tissue culture laboratory has been established with the support of a research grant awarded to **Dr. Jean D. Acton**.

Old Dominion University. A newly approved Ph.D. in Biomedical Sciences program will be jointly offered by Old Dominion University and the Eastern Virginia Medical School. The program is scheduled to begin in September, 1979. A Center for Barrier Islands Studies has been established. Emphasis will be placed on cooperative research and educational programs that will be concerned with the Barrier Island chain located off the Eastern Shore Area of Virginia. The program coordinator is **Dr. Ray S. Birdsong**, who will provide information to interested individuals.

Western Kentucky University. An office of South Central Reservoir Investigations, a division of the U.S. Fish and Wildlife Service, has recently been established in Bowling Green. **Mr. Charles Walburg** leads a seven-man task force to study the development of tailwaters for fisheries and the effects of multilevel discharge on tailwaters and lakes. **Mr. Allen Stickley** of the Denver Wildlife Research Association leads a four-man unit in studies on blackbird roosts involving banding and releasing programs as well as general surveys of crop damage.

St. John's University announces the availability of a position in Animal Ecology at the Assistant or Associate Professor level. The position requires a Ph.D. and an ecology/physiology background; at least two years of college teaching experience are desirable. Interested parties should submit their resume and three professional references to: **Dr. Richard Stalter; Director, Environmental Studies Program; St. John's University; Jamaica, NY 11439.**

The University of North Carolina, Wilmington. The Department of Biology is accepting applications from all interested persons for an Assistant Professor position as Coordinator of Introductory Biology. Send vitae, transcripts and three letters of recommendation to **Dr. Walter C. Biggs, Chairman of the Search Committee, Department of Biology, University of North Carolina at Wilmington, Wilmington, North Carolina 28406.**

CANCELLED AND NO-SHOW PAPERS

Please be reminded that failure to present a scheduled paper at the Annual Meeting disrupts the program, disconcerts those scheduled for presentation of succeeding papers, and disappoints the audience. Professional courtesy requires an individual who submits a paper to accept the responsibility of insuring that the paper is presented as scheduled. If, due to unforeseen circumstances, one cannot be present, try to arrange for a colleague to read the paper. If that is not feasible, the author should notify the **Local Arrangements Program Chairperson** and the **Session Chairperson** at the earliest possible moment.

Papers cancelled **before** the April Bulletin goes to press (about the first of February) can be removed from the program and the other papers in the session rescheduled to avoid inconvenience. A telephone call to the Editor — (502) 745-2446 — is suggested.

EMERITUS MEMBERSHIP

A biologist who has been a member of the ASB for ten or more years and who has retired from professional duties is eligible for election to Emeritus Membership. If you are retiring or have retired, believe you are eligible, and would like to become an Emeritus Member, please notify the Treasurer, *Dr. J. C. O'Kelley; University of Alabama; University, AL 35486.*

PAYMENT OF ANNUAL DUES

Individuals who wish to join the Association for the first time while in attendance at the 1979 Annual Meeting may do so by reporting to the ASB Booth staffed by members of the Executive Committee. "Old" members must mail their dues directly to the Treasurer: *Dr. J. C. O'Kelley; Department of Biology; University of Alabama; University, AL 35486.* The Local Arrangements Committee **will not** accept payment of annual dues!

CHANGE OF ADDRESS

It is your responsibility to notify the ASB when you have a change of address. We can only send your mail when we know where you are, and the Post Office charges the ASB first-class postage on returned mail.

Please send your new address to: *Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences, 19th and the Parkway, Philadelphia, PA 19103.*

Please PRINT new address below:

Name:

New Address:

City: State: Zip code:



The ASB

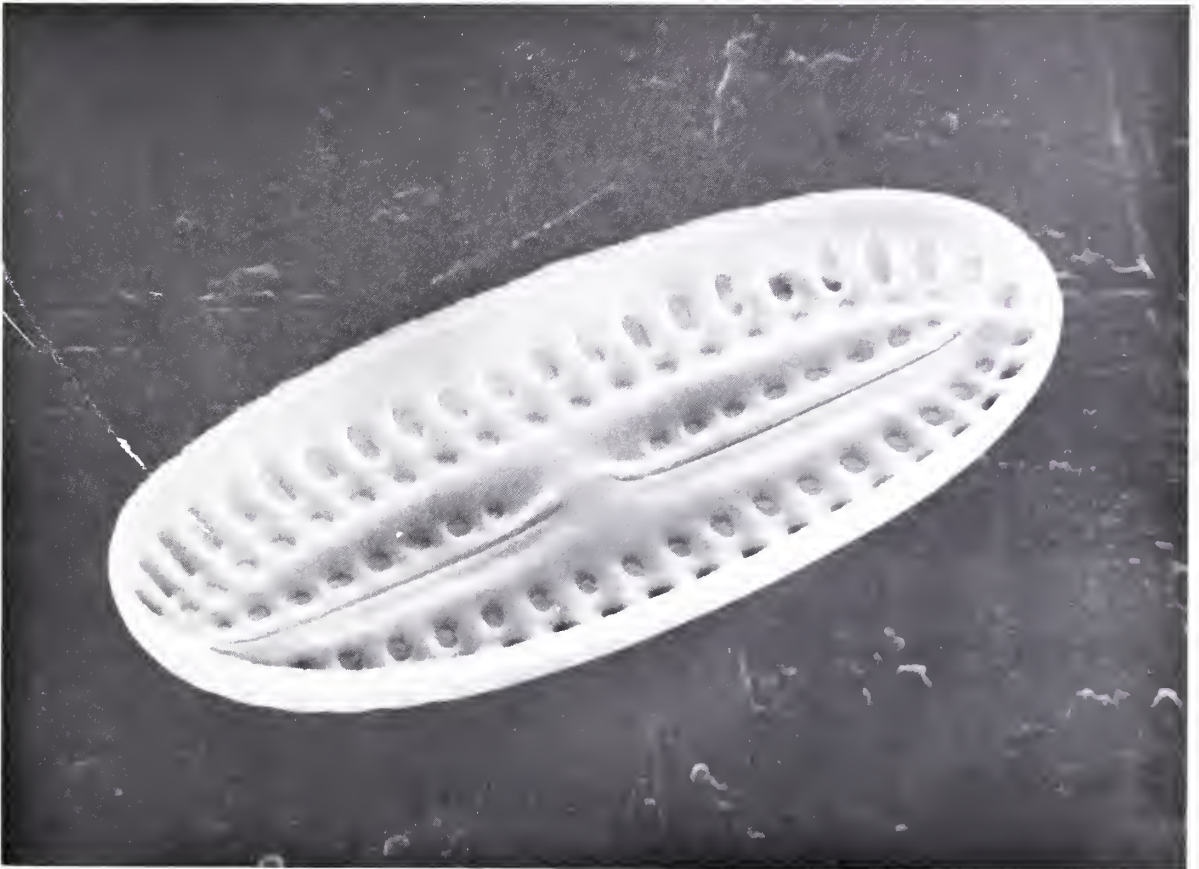
QH301
.A78

BULLETIN

Volume 26, Number 2

(ISSN 0001-2386)

April 1979



Navicula auriculata Hustedt

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. Gary E. Dillard, Editor, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, Ms. 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pa. 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, Al. 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

GARY E. DILLARD
EDITOR

JERRY M. BASKIN
Associate Editor
JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — Raymond O. Flagg, Carolina Biological Supply Co., Burlington, N.C. 27215
Retiring President — Madeline P. Burbanck, Emory University, Atlanta, Ga. 30333
President Elect — James W. Hardin, NC State University, Raleigh, N.C. 27607
Vice-President — Beryl C. Franklin, Northeast Louisiana State University, Monroe, La. 71201
Secretary — Jerry M. Baskin, University of Kentucky, Lexington, Ky. 40506
Treasurer — J. C. O'Kelley, University of Alabama, University, Al. 35486
Archivist — Madeline P. Burbanck
Executive Committee —
J. Frank McCormick (1979), University of Tennessee
Rudolph Prins (1979), Western Kentucky University
Jon R. Fortman (1980), Mississippi University for Women
George M. Simmons, Jr. (1980), VPI & SU
Fr. John H. Mullahy†, Loyola University of the South
Linda M. Stroud (1981), East Carolina University
AAAS Representative, Section G — Franklin F. Flint (1978-81)
AIBS Representative — John M. Herr, Jr. (1978)

†Deceased



CONTENTS

Program of the 40th Annual Meeting	15
Schedule of Paper Sessions	18
Abstracts	34
Author/Abstract-Program Index	103
Thursday Evening Program	107
ASB Candidates for Office	107
News of Biology in the Southeast	111
Challenges and Opportunities for ASB	112

COVER

Scanning electron micrograph of the valve inside the diatom, *Navicula auriculata* Hustedt, collected from sediments beneath the black needle rush, *Juncus roemerianus* Scheele, in Graveline Bay Marsh, Mississippi. Specimen tilted 45°. Courtesy of **M. J. Sullivan** and **M. L. Sullivan**, Biology Department and Electron Microscope Center, Mississippi State University.

PATRONS

Carolina Biological Supply Company; Burlington, NC
Parco Scientific Company; Vienna, OH
Scientific Products; Atlanta, GA
Fisher Scientific Company; Chicago, IL

BUSINESS AFFILIATE

Olinkraft, Incorporated; West Monroe, LA

COPY DEADLINES

July Issue: May 15
October Issue: August 15
January Issue: November 15
April Issue: January 1

Program of the 40th Annual Meeting of the Association of Southeastern Biologists

University Center
University of Tennessee, Chattanooga

A joint meeting with the Southeastern Section of the Botanical Society of America, the Southeastern Chapter of the Ecological Society of America, the Southern Appalachian Botanical Club, the Southeastern Society of Parasitologists, the Southeastern Region of Beta Beta Beta National Honorary Biological Society, the Southeastern Division of the American Society of Ichthyologists and Herpetologists and the Southeastern Fishes Council.

PLACEMENT SERVICE

A placement service to be used both by institutions with positions available and by individuals seeking employment is planned. Space is provided in the Blue and Gold Rooms at the University Center for employers to post position notices and for applicants to post vitae. Persons intending to use this service should bring the necessary information with them in a form ready for posting.

LOCAL POINTS OF INTEREST

A. Campus

1. "Biology in Art," by Bruce Bobick (West Georgia College), will be available for viewing throughout the ASB meeting.
2. Senior Art Show, located in the Art Building behind Brock Hall, includes the works of finishing undergraduates.

B. Chattanooga Area

1. Point Park, Lookout Mountain, provides on a clear day an excellent view of Chattanooga, Moccasin Bend of the Tennessee River and general environs. Ochs Museum provides a historical narrative of the Civil War's "Battle Above the Clouds." No admission charge.
2. Chattanooga Choo-Choo, 1400 Market Street, is south of the downtown business section and is a remodeled depot of the Southern Railroad. It provides hotel accommodations, dining facilities, night entertainment, arts and crafts shops, bookstore, model railroad museum (\$1.00) and an operating trolley car (\$0.10), among other attractions.
3. Houston Antique Museum, 201 High Street near the Hunter Museum of Art, has a collection of glass antiques. Admission is charged.
4. Hunter Museum of Art, 10 Bluff View, combines traditional and contemporary architecture. The Museum has permanent and changing exhibits. Admission: Donation requested.

5. Tennessee Valley Railroad Museum, 2202 N. Chamberlain, opens annually in mid- to late-April. It features a steam-powered locomotive that provides a train ride over a 3½ mile track with one tunnel and three bridges. Admission is charged.
6. Rock City Garden, atop Lookout Mountain, features a fantasy-land of nursery rhymes. Admission: \$3.50.
7. Plum Nelly Shop and Gallery, 1201 Hixson Pike, is an example of several shops in Chattanooga that emphasize arts and crafts of Southern Appalachian artisans.
8. Reflection Riding, off I-24 west of Chattanooga, offers an array of spring flora, mainly wildflowers, that may be viewed from a car. Admission: About \$1.00/vehicle.

FIELD TRIPS

- A. Copper Basin. Denuded by a combination of logging, mining and copper smelting processes in the late 19th and early 20th centuries, the Copper Basin remains in many places a barren landscape subject to the physical forces of nature. Reclamation attempts are in progress. About 3/4 day.
- B. Botanical Tour of Chickamauga and Chattanooga National Military Park. An introduction to the local flora of the Chattanooga-North Georgia area, including a local limestone cedar glade, will be available in the National Military Park. About 1/2 day. Leader: **Dr. Gene Van Horn.**

PARKING

Two lots adjacent to Holt Hall and the University Center have been reserved for the use of those attending the ASB meeting. Parking permits will be available at the ASB Registration Desk and should be placed in the car as soon as possible. Cars parked in the two reserved lots will receive tickets if not identified as being ASB-registered.

PROGRAM SUMMARY

Wednesday, April 25, 1979

6:00- 9:00 P.M. REGISTRATION and
INFORMATION
**First Floor Lobby, University
Center**
Fees: Registration, \$5.00 regular;
\$3.00 student; ASB Banquet, \$6.50
(Prime Rib Buffet) — *Deadline:* 5:00 P.M.,
Thursday, April 26; Meeting
Program, \$1.25; Parasitology
Luncheon, \$4.00 (Chicken/
Ham Buffet) — *Deadline:*

11:00 A.M., Thursday, April
26; Ecology Luncheon, \$4.00
(Chicken/Ham Buffet) —
Deadline: 11:00 A.M., Friday,
April 27.
Message Center Telephones:
University Center — (615)
755-4242; Biology Department —
(615) 755-4341.
Field Trip Registrations: *Deadline* —
12:00 Noon, Friday, April 27.

Thursday, April 26, 1979

8:00 A.M.- 7:00 P.M. REGISTRATION and
INFORMATION
**First Floor Lobby, University
Center**
PLACEMENT SERVICE
**Blue and Gold Rooms, University
Center**
8:00 A.M.- 5:00 P.M. EXHIBITS
**Chattanooga Rooms B and C,
University Center**
8:00 A.M.-Noon SYMPOSIUM — *Biology of
Endangered and Threatened
Species in the Southeastern
United States.*
**Chattanooga Room A, University
Center (No Smoking)**
8:00 A.M.-Noon PAPER SESSIONS
(No Smoking)
Ichthyology and Herpetology,
I: **Grote Hall 129**
Aquatic Ecology, I: **Grote Hall
131**
Plant Physiology: **Holt Hall 307**
Parasitology, I: **Holt Hall 124**
Animal Physiology, I: **Signal
Mtn. Room, University Center**
Cytology and Genetics, I: **Holt
Hall 116**
11:00 A.M.- 1:00 P.M. BUSINESS MEETING AND
LUNCHEON, Southeastern
Society of Parasitologists:
**Lookout Mtn. Room, University
Center** (obtain ticket
at Registration Desk).
Speaker: *Dr. Wilford S.
Bailey*, Auburn University.

1:00 P.M.- 5:30 P.M. PAPER SESSIONS
(No Smoking)
Ichthyology and Herpetology,
II: **Grote Hall 129**
Aquatic Ecology, II: **Grote Hall
131**
Plant Ecology, I: **Chattanooga
Room A, University Center**
Parasitology, II: **Holt Hall 124**
Animal Physiology, II: **Signal
Mtn. Room, University Center**
Cytology and Genetics, II: **Holt
Hall 116**
1:00 P.M.- 2:00 P.M. WORKSHOP, TEACHING
METHODS: Conference
**Rooms 2 and 3, University
Center**
3:00 P.M. EXECUTIVE COMMITTEE
MEETING, ASB
**Conference Rooms 2 and 3,
University Center**
7:30 P.M. GENERAL SESSION, ASB
**Chattanooga Room A, University
Center**
ADDRESS OF WELCOME: *Dr.
James Drinnon*, Chancellor;
University of Tennessee,
Chattanooga
RESPONSE: *Dr. Raymond O.
Flagg*, President; Association
of Southeastern Biologists
SYMPOSIUM: Pollination Biology
Dr. James W. Wallace, Western

Carolina University; Introduction
Dr. Morris Levy, Purdue University: "Phytochemical Advertisements for Pollinators"
Dr. Larry L. Wolf, Syracuse

University: "Pollinators and Foraging Behavior"
 9:00 P.M.-11:00 P.M. **SMOKER AND EXHIBITS:**
Lookout Mtn. Room and Chattanooga Rooms B and C, University Center

Friday, April 27, 1979

- | | | | |
|----------------------|---|----------------------|---|
| 7:15 A.M. | BUSINESS MEETINGS AND BREAKFAST, Southern Appalachian Botanical Club and Southeastern Section, Botanical Society of America: Lookout Mtn. Room, University Center | 11:00 A.M. | BUSINESS MEETING, ASB Grote Hall 129 |
| 8:00 A.M. | PAST PRESIDENTS' BREAKFAST: U.C. Foundation Room, University Center | Noon-1:30 P.M. | BUSINESS MEETING AND LUNCHEON, Southeastern Chapter, Ecological Society of America: Lookout Mtn. Room, University Center (obtain ticket at Registration Desk). |
| 8:00 A.M.-11:00 A.M. | REGISTRATION
First Floor Lobby, University Center | 1:00 P.M.- 5:30 P.M. | PAPER SESSIONS
(No Smoking)
Beta Beta Beta: Holt Hall 307
Ichthyology and Herpetology, IV: Grote Hall 129
Aquatic Ecology, IV: Grote Hall 131
Plant Ecology, III: Chattanooga Room A, University Center
Plant Systematics, II: Holt Hall 124
Animal Ecology, II: Signal Mtn. Room, University Center
Cryptogamic Botany, II: Holt Hall 116 |
| 8:00 A.M.- 5:00 P.M. | PLACEMENT SERVICE
Blue and Gold Rooms, University Center | 4:00 P.M. | BUSINESS MEETING, Southeastern Division of the American Society of Ichthyologists and Herpetologists: Grote Hall 129 |
| 8:00 A.M.-Noon | EXHIBITS
Chattanooga Rooms B and C, University Center | 7:00 P.M. | ASB BANQUET AND PRESENTATION OF AWARDS
Main Dining Room, University Center (obtain ticket at Registration Desk).
Association Research Prize, Sponsored by Carolina Biological Supply Company
Meritorious Teaching Award, Sponsored by Scientific Products
Retiring President's Address: <i>Dr. Madeline P. Burbanck</i> , Emory University |
| 8:00 A.M.-11:00 A.M. | PAPER SESSIONS
(No Smoking)
Ichthyology and Herpetology, III: Grote Hall 129
Aquatic Ecology, III: Grote Hall 131
Plant Ecology, II: Chattanooga Room A, University Center
Plant Systematics, I: Holt Hall 124
Animal Ecology, I: Signal Mtn. Room, University Center
Cryptogamic Botany, I: Holt Hall 116
Invertebrate Zoology: Holt Hall 307 | | |
| 8:00 A.M.- 9:20 A.M. | STUDENT RESEARCH DISCUSSION SESSION, Southeastern Society of Parasitologists; Leaders: <i>Mr. Bruce A. Lindemann</i> , Student President; <i>Ms. Doreen Dalesandro</i> , Student Vice-President; and <i>Dr. E. L. Roberson</i> , Chairman, Student Liaison Committee. Holt Hall 207 | | |
| 9:40 A.M.-11:00 A.M. | PRESIDENT'S SYMPOSIUM ON THE TEACHING OF PARASITOLOGY, South- | | |

Saturday, April 28, 1979

8:00 A.M.

FIELD TRIPS: Biology Building Parking lot near Greenhouse; Register for all field trips and see details about transportation at Registration Desk by Noon, Friday, April 27.

8:30 A.M.

ASB EXECUTIVE COMMITTEE BREAKFAST AND BUSINESS MEETING
Sheraton Hotel, 407 Chestnut St.

SCHEDULE OF PAPER SESSIONS

THURSDAY MORNING — APRIL 26

BIOLOGY OF ENDANGERED AND THREATENED SPECIES IN SOUTHEASTERN UNITED STATES

Chattanooga Room A, University Center

Symposium co-sponsored by the Association of Southeastern Biologists and the Southeastern Chapter of the Ecological Society of America. Organized by John R. Bozeman, Georgia Department of Natural Resources and J. Whitfield Gibbons, Savannah River Ecology Laboratory, University of Georgia.

Part I. Endangered and Threatened Plant Species

Chairman: **John R. Bozeman, Georgia Department of Natural Resources**

- | | | |
|-----------|--|---|
| 8:05 A.M. | Introduction. JOHN R. BOZEMAN. | (Limestone) Glades in Southeastern United States. |
| 8:10 | 341. PITILLO, J. DAN (Western Carolina University). Southern Appalachian Endangered and Threatened Flowering Plants. | 9:10 344. BURBANCK, MADELINE P. (Emory University). Endangered and Threatened Species of Plants on Granite Outcrops of Georgia. |
| 8:30 | 342. EVANS, A. MURRAY (University of Tennessee). Survival Strategies of Rare Southern Appalachian Pteridophytes. | 9:30 345. KRAL, ROBERT (Vanderbilt University). Endangered or Threatened Vascular Plant Species of the Florida Sandscrub. |
| 8:50 | 343. BASKIN, JERRY M. AND CAROL C. BASKIN (University of Kentucky). Studies on the Ecology of Plant Species Endemic to Cedar | 9:50 RECESS |

Part II. Endangered and Threatened Animal Species

Chairman: **J. Whitfield Gibbons, Savannah River Ecology Laboratory**

- | | | |
|-------|---|--|
| 10:05 | Introduction. J. WHITFIELD GIBBONS. | gator: Studies of the Biology of a Recovered Endangered Species. |
| 10:10 | 346. ETNIER, DAVID (University of Tennessee). Biology of the Snail-Darter (<i>Percina tanasi</i>), An Endangered Species. | 11:10 349. JACKSON, JERRY A. (Mississippi State University). Behavioral Ecology of Red-Cockaded Woodpeckers. |
| 10:30 | 347. MEANS, BRUCE (Tall Timbers Research Station). Biology of the Pine Barrens Treefrog (<i>Hyla andersoni</i>). | 11:30 350. RATHBUN, GALEN B. (National Fish and Wildlife Laboratory, Gainesville, FL). Manatee Movements in Relation to Water Temperature. |
| 10:50 | 348. BRISBIN, I. LEHR, JR. (Savannah River Ecology Laboratory). The American Alli- | 11:50 Conclusion of Symposium. |

Grote Hall, Room 129

Presiding: Dr. Wayne C. Starnes, University of Tennessee

- | | | |
|---|--|---|
| <p>8:00</p> <p>8:13</p> <p>8:26</p> <p>8:39</p> <p>8:52</p> <p>9:05</p> <p>9:18</p> <p>9:31</p> <p>9:44</p> | <p>1. SHIPP, R. L. (University of South Alabama). Observations of Deep Water Reef Fishes of the Northern Rim of the Desoto Canyon by Means of Research Submersible.</p> <p>2. HARRIS, TONY AND D. G. LINDQUIST (East Carolina University and University of North Carolina, Wilmington). Trophic Partitioning in Four Species of Reef Fishes in Onslow Bay, North Carolina.</p> <p>3. HILL, S. R. AND F. J. SCHWARTZ (Institute of Marine Sciences, University of North Carolina). Feasibility of Utilizing Scale Characteristics in the Identification and Keying of Western Atlantic Flatfishes.</p> <p>4. SCHWARTZ, F. J. (Institute of Marine Sciences, University of North Carolina). Caudal Peduncle Droop in Blueback Herring, <i>Alosa aestivalis</i>, from Cape Fear River, North Carolina.</p> <p>5. TIMMONS, T. S., W. L. SHELTON AND W. D. DAVIES (Auburn University). Sampling of Reservoir Fish Populations in Littoral Areas with Rotenone.</p> <p>6. KRAEMER, J. E. (University of Georgia). Variation in Incubation Length of Loggerhead Sea Turtle (<i>Caretta caretta</i>) Clutches on the Georgia Coast.</p> <p>7. BEETS, J. P. AND N. M. BURKHEAD (University of Tennessee). Some Thoughts on Stoneroller Minnows (<i>Campostoma anomalum</i>).</p> <p>8. GILBERT, R. J. AND A. R. HEIDT (University of Georgia). Movements of Short-nose Sturgeons, <i>Acipenser brevirostrum</i>, in the Altamaha River, Georgia.</p> <p>9. BRADLEY, W. K., JR. (Florida Technologi-</p> | <p>cal University). Short-term Stranding of Cyprinodontid Eggs.</p> <p>9:57
10:10
10:23
10:36
10:49
11:02
11:15
11:28
11:41</p> <p>BREAK</p> <p>10. SNELSON, F. F., JR. (Florida Technological University). Variation in Reproductive Performance of the Livebearing Fish, <i>Poecilia latipinna</i>.</p> <p>11. SWOFFORD, D. L. AND B. A. BRANSON (Eastern Kentucky University). Protein Variation and Genetic Differentiation in <i>Chologaster</i>.</p> <p>12. MATTHEWS, W. J. AND R. E. JENKINS (Roanoke College and Virginia Commonwealth University). A Distinctive Madtom Catfish from the Dan River, Virginia.</p> <p>13. LEE, D. S. AND R. E. ASHTON, JR. (North Carolina State Museum). Seasonal and Daily Activity Patterns of the Glossy Darter, <i>Etheostoma vitreum</i>.</p> <p>14. SHIPP, ELIZABETH, W. BRANDES AND J. HARRIS (Tennessee Technological University). Taxonomic Status of the Brook Trout in the Great Smoky Mountains National Park Based on Electrophoretic Data.</p> <p>15. PISTOLAS, S. A., C. H. HOCUTT AND J. R. STAUFFER, JR. (University of Maryland). Fishes of the Monongahela National Forest.</p> <p>16. DOUCETTE, A. J., JR. AND J. M. FITZSIMMONS (Louisiana State University). Karyology of the Shads, <i>Dorosoma cepedianum</i> and <i>D. petenense</i>.</p> <p>17. ANDERSON, H. M., T. H. HANDSEL AND D. G. LINDQUIST (Institute of Marine Sciences, UNC; North Carolina Marine Resources Center; and University of North Carolina, Wilmington). Additional Notes on Tropical Reef Fishes in the Carolinas with Zoogeographic Considerations.</p> |
|---|--|---|

Grote Hall, Room 131

Presiding: Dr. Patricia Perfetti, University of Tennessee, Chattanooga

- | | | |
|---|---|---|
| <p>8:00</p> <p>8:13</p> <p>8:26</p> <p>8:39</p> | <p>18. HUDSON, W. F. AND F. J. BULOW (Tennessee Technological University). Squamation of the Bluegill, <i>Lepomis macrochirus</i>, in Early Life and its Relationship to Age and Growth Studies.</p> <p>19. JAMES, B. T., F. J. BULOW AND M. J. VAN DEN AVYLE (Tennessee Technological University). Feeding, Growth and Competitive Interrelationships of <i>Morone chrysops</i> and <i>M. mississippiensis</i>.</p> <p>20. BULOW, F. J. AND R. D. ANDERSON (Tennessee Technological University). Some Sublethal Effects of <i>Posthodiplostomum minimum</i> on <i>Lepomis macrochirus</i>.</p> <p>21. DOWNEY, P. C. AND J. V. CONNER (Louisiana State University). Macroinvertebrate</p> | <p>Communities of a Lower Mississippi River Floodplain Slough.</p> <p>8:52
9:05
9:18</p> <p>22. OBI, AKOLISA AND J. V. CONNER (Louisiana State University). Spring and Summer Macroinvertebrate Drift in the Lower Mississippi River, Louisiana.</p> <p>23. RITCHIE, J. C., J. R. MCHENRY, C. M. COOPER AND F. R. SCHIEBE (USDA-SEAR, National Program Staff and Sedimentation Laboratory). Sediment Accumulation in Lake Chicot, Arkansas.</p> <p>24. HOBERG, C. M. (Law Engineering Testing Company). The Responses of Blue Crabs (<i>Callinectes sapidus</i> Rathbun) to Laboratory Thermal Gradients.</p> |
|---|---|---|

- 9:31 25. WHITTINGTON, D. W. AND L. A. KNIGHT, JR. (Mississippi Air and Water Pollution Control Commission and University of Mississippi). Rotifers as Indicators of Domestic Pollution.
- 9:44 26. KATHMAN, DEEDEE AND E. L. MORGAN (Associated Water and Air Resources Engineers, Inc. and Tennessee Technological University). Comparison of a New Artificial Substrate Sampler with Other Benthic Sampling Techniques.

PLANT PHYSIOLOGY

Holt Hall, Room 307

Presiding: Dr. David A. Steen, Southern Missionary College

- 8:00 27. LAWSON, V. R. AND G. D. KNOX (Bethune-Cookman College). Effects of BaCl_2 , CuCl_2 , MnCl_2 , NiCl_2 and $\text{Pb}(\text{NO}_3)_2$ on the Growth of Intact Seedlings of *Triticum vulgare* cv Arthur.
- 8:13 28. LAWSON, V. R. AND G. D. KNOX (Bethune-Cookman College). Effects of NiCl_2 and CuCl_2 on Growth of Apical Coleoptile segments of *Triticum vulgare*.
- 8:26 29. ROSS, J. W., J. K. HARDMAN AND J. C. O'KELLEY (University of Alabama). Flavin Compounds as Agents for the Photooxidation of Plastocyanin in Blue Light.
- 8:39 30. STONE, B. P. AND W. H. ATKINSON (Austin Peay State University). Reversal of Hormone Stimulated Pea Epicotyl Elongation by Concanavalin-A and Bacitracin.
- 8:52 31. JOHNSON, R. H., C. E. O'REAR AND G. C. LLEWELLYN (Virginia Commonwealth University and George Washington University). Environmental Factors and Aflatoxin Occurrence in Shelled Peanuts.
- 9:05 32. CREEK, ROBERT (Eastern Kentucky University). Investigation of Plant Hormones in the Green Alga, *Pediastrum tetras*.
- 9:18 33. JOHNSON, D. L. (College of Charleston). An Electrophoretic Study of *Spartina alterniflora* Organs, Individuals and Populations.
- 9:31 34. JOHNSON, D. L. (College of Charleston). Effect of Storage on Germination of *Spartina alterniflora*.
- 9:44 35. LUVALL, J. C. AND C. E. MURPHY, JR. (Savannah River Ecology Laboratory and Savannah River Laboratory). Distribution of Free and Bound Tritiated Water in *Pinus taeda* L.
- 9:57 36. EPLEE, R. L. (USDA, Whiteville Methods Development Laboratory). Haustorial Initiation in Witchweed (*Striga asiatica*).
- 10:10 37. RIOPEL, J. L. AND J. STEFFENS (University of Virginia). Experimental Induction of Haustoria in the Root Parasite, *Agalinis purpurea*.

PARASITOLOGY, SESSION I

Holt Hall, Room 124

Presiding: Dr. James H. Oliver, Jr. and

J. Mathews Pound, Georgia Southern College

- 8:00 38. ENTREKIN, D. L. AND J. H. OLIVER, JR. (Georgia Southern College). Effects of Gamma Radiation of Oviposition and Fertility of *Dermanyssus gallinae* (DeGeer) Irradiated as Unfed Protonymphs.
- 8:13 39. LONDON, C. E., E. L. ROBERSON AND J. W. MCCALL (University of Georgia). Control Critical Anthelmintic Evaluation of Mebendazole Against Induced and Naturally Occurring Helminth Infections in Cats.
- 8:26 40. NANCE, R. F. AND E. L. ROBERSON (University of Georgia). Comparative Effects of Different Modes of Administration of Thienium Closylate Against Hookworm Infections in Dogs.
- 8:39 41. CAMP, J. W., JR., M. C. MONDL AND G. W. ESCH (Wake Forest University). Response of *Diplostomulum scheuringi* Cercariae to Mosquito-fish Conditioned Water in Agar Blocks.
- 8:52 42. MONDL, M. C., J. W. CAMP, JR. AND G. W. ESCH (Wake Forest University). Phototactic Responses by Cercariae of *Diplostomulum scheuringi*.
- 9:05 43. ROGERS, M. D., J. A. BUTTS AND W. A. PHILLIS (University of North Carolina, Charlotte). An Ultrastructural Analysis of *Dipetalonema viteae* in Its Vector, *Ornithodoros tartakovskyi*.
- 9:18 44. BURGESS, D. E. AND W. L. HANSON (University of Georgia). *Trypanosoma cruzi*: Role of Macrophages and Lymphocytes in Immunological Memory.
- 9:31 45. PARKER, B. W. AND T. W. HOLBROOK (Medical University of South Carolina). Experimental Infection of Chick Embryos with *Naegleria fowleri*.
- 9:44 46. BOGITSH, B. J. (Vanderbilt University). The Effects of Actinomycin-D on the Ultrastructure of *Schistosoma mansoni* Schistosomules Grown *In Vitro*.
- 9:57 47. MCCALL, J. W., PAMELA HO AND JUNG JUN (University of Georgia). Microfilaricidal Activity of Avermectin B_{1a} Against *Litomosoides carinii*.

- 10:10 48. WHEAT, B. E. AND W. J. COOK (University of Illinois and Great Smoky Mountains National Park). Coccidia of Wild Hogs from Great Smoky Mountains National Park, Tennessee.
- 10:23 49. TALTON, E. L. AND G. C. MILLER (North Carolina State University). Spatial Aspects of Helminth Communities of Cotton Rats.
- 10:36 50. DAY, S. P. AND G. C. MILLER (North Carolina State University). Parasites of Some Fishes From Hyco Lake, North Carolina.

ANIMAL PHYSIOLOGY, SESSION I

Signal Mountain Room, University Center

Presiding: Dr. R. E. Garth, University of Tennessee, Chattanooga

- 9:18 51. TATE, L. G., W. E. HAWKINS, C. A. FOSTER AND T. G. SARPHIE (University of South Alabama and Gulf Coast Research Laboratory). The Acute Effects of Cadmium on Kidney and Gill of the Teleost, *Leiostomus xanthurus*.
- 9:31 52. WEEKLEY, L. B., M. JONES AND T. D. KIMBROUGH (Virginia Commonwealth University). Reduced Hepatic Tryptophan Oxygenase Activity in Xanthopterin Treated Rats.
- 9:44 53. SHAFER, S. C., L. B. WEEKLEY, M. WEAVER, T. D. KIMBROUGH AND G. C. LLEWELLYN (Virginia Commonwealth University). Possible Modification of the Hepatic Tryptophan 2,3 Dioxygenase Apoenzyme-cofactor Bond by Aflatoxin.
- 9:57 54. THOMAS, C. R. AND F. H. LAUTER (University of South Carolina). The Subnuclear Array of Neuron Perikarya in the Hypoglossal Nucleus of *Mus musculus* as Revealed by the Retrograde Axonal Transport of Horseradish Peroxidase.
- 10:10 55. NEWMAN, G. A. AND P. S. CAMPBELL (University of Alabama, Huntsville). Differential Effects of a Steroidal and a Non-steroidal Estrogen Upon Uterine Responsivity.
- 10:23 56. LARNER, E. H. AND C. L. RUTHERFORD (Radford College and Virginia Polytechnic Institute and State University). Metabolic Profiles of Individual Human Mammary Tumors.
- 10:36 57. ABBOTT, T. M. AND A. E. LINKINS (Virginia Polytechnic Institute and State University). Evidence of Cellulose and Chitin Digestion by Brook, Brown and Rainbow Trout.
- 10:49 58. DAVIS, K. B. AND N. C. PARKER (U.S. Fish and Wildlife Service). Plasma Adrenal Steroid Hormone Levels in Channel Catfish Under Experimental Conditions.
- 11:02 59. ALLEN, B. AND R. LINDAHL (University of Alabama). Appearance of the Tumor-Specific Aldehyde Dehydrogenase Phenotype During 2-Acetylaminofluorene-Induced Hepatocarcinogenesis in Rats.
- 11:15 60. GILLESPIE, M. E., N. HEISLER AND G. R. ULTSCH (University of Alabama and Max Planck Institute for Experimental Medicine). A Reevaluation of the Relationship Between Temperature and the Critical Oxygen Tension of Freshwater Fishes.
- 11:28 61. WEEKLEY, L. B., M. JONES AND T. D. KIMBROUGH (Virginia Commonwealth University). Altered Tryptophan Oxygenase and Tyrosine Amino Transferase Activity in the Osborne-Mendel "Fatty" Rat.

CYTOLOGY AND GENETICS, SESSION I

Holt Hall, Room 116

Presiding: Dr. W. S. Flory, Wake Forest University

- 8:00 62. FLORY, W. S. AND G. L. SMITH (Wake Forest University). Cytological Studies on Some Species and Hybrids of *Habranthus*.
- 8:13 63. HERR, J. M., JR. (University of South Carolina). Methods for Permanently Mounting Ova Cleared in 4½-Type Clearing Fluids.
- 8:26 64. DONNELLY, L. S. AND P. L. WALNE (University of Tennessee). Comparative Ultrastructure of Three Species of *Trachelomonas* (Euglenophyceae).
- 8:39 65. ETGES, W. J. AND M. H. SMITH (University of Georgia and Savannah River Ecology Laboratory). Niche Width and Genetic Variation in Treefrogs of the Piedmont and Coastal Plain of South Carolina.
- 8:52 66. MONACO, P. J., E. M. RASCH AND J. BALSANO (East Tennessee State University and University of Wisconsin, Parkside). Reproductive Biology of Poeciliid Fishes from Northeastern Mexico.
- 9:05 67. MILLER, P. D., H. E. SMITH AND R. LINDAHL (University of Alabama). Localization of Aldehyde Dehydrogenase in Rat Liver Cells.
- 9:18 68. LAKE, C. H. AND I. T. MCCLURKIN (University of Mississippi). Demonstration of Uric Acid for Electron Microscopy.
- 9:31 69. OSTROWSKI, R. S. AND R. W. WILSON (University of North Carolina, Charlotte). Cellular Development in *Coclopa frigida* (Diptera): A Study Using Liquid Scintillation Techniques.

- 9:44 70. JONES, R. A., E. A. RUPERT AND O. W. BARNETT (Clemson University). Virus Infection of *Trifolium* (Leguminosae) in Suspension Culture.
- 9:57 71. MCCARTHY, J. I. AND E. A. RUPERT (Clemson University). On the Effects of 2,4-D and Picloram on Ploidy Levels of White Clover Callus Culture.
- 10:10 72. JONES, K. E. AND A. L. WILLIAMS (Murray State University). Characterization of Lambda Lysogens Carrying DNA Segments (ilv) from *Escherichia coli* K-12.

THURSDAY AFTERNOON — APRIL 26

ICHTHYOLOGY AND HERPETOLOGY, SESSION II

Grote Hall, Room 129

Presiding: Dr. David Etnier, University of Tennessee

- 1:00 73. ETNIER, D. A. AND W. C. STARNES (University of Tennessee). Two Species of "*Noturus elegans*" from the Duck River System, Tennessee.
- 1:13 74. WILLIAMS, J. D. AND D. A. ETNIER (University of Tennessee and U.S. Fish and Wildlife Service). A new species of *Fundulus* from Central Tennessee.
- 1:26 75. LINDQUIST, D. G. AND TONY HARRIS (University of North Carolina, Wilmington and East Carolina University). Population Dynamics of Reef Fishes on a Nearshore Rock Scarp in Onslow Bay, North Carolina.
- 1:39 76. CHANDLER, G. T. AND D. G. LINDQUIST (University of North Carolina, Wilmington). Comparative Ecology of Two Species of Co-Inhabiting Tide Pool Blennies.
- 1:52 77. WALLACE, R. K., JR. (Auburn University). Reproductive Behavior of the Blue-stripe Shiner, *Notropis callitaenia*, in Uchee Creek, Alabama.
- 2:05 78. WILLIAMS, J. D. AND H. W. ROBINSON (U.S. Fish and Wildlife Service and Southern Arkansas University). Description of a New Subgenus of *Etheostoma*.
- 2:18 79. SHUTE, P. W., J. R. SHUTE AND D. G. LINDQUIST (University of North Carolina, Wilmington). Notes on the Spawning, Fecundity and Diet of the Waccamaw Killifish, *Fundulus waccamensis*.
- 2:31 80. BRANSTETTER, STEVEN (University of South Alabama and Dauphin Island Sea Lab). Reproductive Cycles and Maturity Determinations in Carcharhinid Sharks of the Northern Gulf of Mexico.
- 2:44 81. TATUM, F. M., H. BOSCHUNG AND R. LINDAHL (University of Alabama). An Isozymic Comparison of Two Distinct Chromosomal Races of *Fundulus notatus*.
- 2:57 BREAK
- 3:10 82. THOMPSON, B., S. LEVINE, S. VERRET AND M. FANNALY (Louisiana State University). Distribution and Ecology of the Fishes of Lake Pontchartrain and Nearby Marshes.
- 3:23 83. WIERNICKI, C. AND D. T. DRYSDALE (University of West Florida). Some Observations on the Pituitaries of Intersexual *Gambusia affinis*.
- 3:36 84. HOLLINGSWORTH, C. L. AND S. A. BORTONE (University of West Florida). Validation of Methods Used in the Age Determination of Red Snapper, *Lutjanus campechanus*.
- 3:49 85. TOUART, L. W. (University of West Florida). Studies on an Accessory Reproductive Structure in a Synchronous Hermaphrodite.
- 4:02 86. SIEGEL, D. M., S. A. BORTONE AND J. L. OGLESBY (University of West Florida). Taxometric Comparison of Feeding Strategies in Lutjanid Fishes.
- 4:15 87. FEENEY, T., E. DONAHUE AND S. A. BORTONE (University of West Florida). Gonad Morphology of *Pikea mexicana*.
- 4:28 88. PENN, J. S. AND R. PARRISH (University of West Florida and Bionomics, Inc.). A Hermaphroditic Largemouth Bass, *Microp-terus salmoides*.

AQUATIC ECOLOGY, SESSION II

Grote Hall, Room 131

Presiding: Dr. Eric L. Morgan, Tennessee Technological University

- 1:00 89. MARTINO, L., E. L. MORGAN AND J. ORR (Tennessee Technological University). Acute Toxicity of Characteristic Acid Strip Mine Wastes to Aquatic Macroinvertebrates.
- 1:13 90. PARKER, N. C., K. B. DAVIS AND J. R. TOMASSO (U.S. Fish and Wildlife Service and Memphis State University). Methemoglobin Formation in Channel Catfish Intensively Cultured in Aerated Ponds.
- 1:26 91. COOPER, C. M. AND K. W. ROUSH (USDA Sedimentation Laboratory). Effects of Inflowing Sediments on Plankton Production.
- 1:39 92. MODLIN, R. F. (University of Alabama, Huntsville). Limnological Events in a Temporary Pond.
- 1:52 93. READING, J. T. AND A. L. BUIKEMA, JR. (Virginia Polytechnic Institute and State University). The Sublethal Effects of Selenium on the Biology of *Daphnia pulex*.

- 2:05 94. MELISKY, E. L., J. R. STAUFFER, JR. AND C. H. HOCUTT (University of Maryland). Temperature Preference of Three Important Freshwater Fish Species in the Middle Atlantic Region.
- 2:18 95. REISH, R. L., K. R. DIXON, C. H. HOCUTT AND J. R. STAUFFER, JR. (University of Maryland). A Preliminary Investigation of Selected Female Trout Harvests with the Use of the Leslie Matrix Model.
- 2:31 96. VANN, D. K., D. R. LISPI, C. H. HOCUTT AND J. R. STAUFFER, JR. (University of Maryland). Effects of a Gasoline Spill on Macroinvertebrates and Fish.
- 2:44 97. WILLIAMS, R. D., T. Y. BARILA, C. H. HOCUTT AND J. R. STAUFFER, JR. (University of Maryland). Longitudinal Distribution of the Fishes of Raystown Branch, Juniata River, Susquehanna River Drainage.
- 2:57 98. BARILA, T. Y., J. R. STAUFFER, JR. AND C. H. HOCUTT (University of Maryland). Temperature Preference of the American Eel, *Anquilla rostrata* (Lesueur) from Maryland.
99. Paper Canceled.
- 3:10 100. BOSNAK, A. AND E. L. MORGAN (Tennessee Technological University). Comparison of Acute Toxicity Between Epigeal and Hypogean Isopods to Zinc, Cadmium and Total Residual Chlorine.
- 3:23 101. MORGAN, E. L., K. W. EAGLESON, N. D. MCCOLLOUGH, R. HERRMAN, R. C. MATHEWS AND R. E. BURGE (Tennessee Technological University, North Carolina Department of Natural Resources and National Park Service). Automated Biosensing from Remote Platforms and NOAA GOES Satellite Data Retrieval for Water Quality Management.
- 3:36 102. ANDRYSZAK, B. L. AND F. M. TRUESDALE (Louisiana State University). Abundance and Distribution of Larval Reptant Decapod Crustaceans in Neritic Waters of the Northern Gulf of Mexico, July, 1976.
- 3:49 103. DORWARD, E. J. AND D. W. EVANS (Maryville College and Savannah River Ecology Laboratory). Bicarbonate Utilization by *Utricularia* (Lentibulariaceae) and the Influence of pH and Alkalinity on the Distribution of Some South Carolina Species.
- 4:02 104. EVANS, D. W., M. F. BABCOCK AND E. J. DORWARD (Savannah River Ecology Laboratory). Testing Aquatic Plants for the Ability to Use Bicarbonate Ion in Photosynthesis.
- 4:15 105. DAL SANTO, D. J. AND J. H. RODGERS, JR. (East Tennessee State University). Bluegill (*Lepomis macrochirus*) Blood Enzymes as Indicators of Exposure to Sublethal Concentrations of Cadmium.
- 4:28 106. WALLACE, L. J. D. AND J. H. RODGERS, JR. (East Tennessee State University). Periphyton Respiratory Electron Transport System as an Indicator of Perturbation in the Watauga River, Tennessee.
- 4:41 107. MOLLOY, B. K. AND J. H. RODGERS, JR. (East Tennessee State University). Periphyton Respiration in the Watauga River, Tennessee: Impact of Industrial and Municipal Effluents.

PLANT ECOLOGY, SESSION I

Chattanooga Room A, University Center

Presiding: Dr. Thomas Hemmerly, Middle Tennessee State University

- 1:00 108. HEMMERLY, T. E. (Middle Tennessee State University). Competitive Ability of a Highly Endemic Cedar Glade Species: *Echinacea tennesseensis*.
- 1:13 109. CLARK, R. C. (Erskine College). Reproduction of Native American Chestnut at a Site in the Georgia Piedmont.
- 1:26 110. KEEVER, CATHERINE (Millersville State College). Causes of Plant Succession on Old Fields of Lancaster County, Pennsylvania.
- 1:39 111. VAN HORN, G. S. (University of Tennessee, Chattanooga). The Success of Alien Angiosperm Species in Chickamauga Battlefield.
- 1:52 112. WEISS, EDWARD (University of Georgia). Fire in a *Sarracenia flava* Community.
- 2:05 113. BORING, L. R. (University of Georgia). The Role of Successional Vegetation in Nutrient Conservation on a Clearcut Appalachian Watershed.
- 2:18 114. PLUMMER, G. L. (University of Georgia). Some Changes in the Native Biota at Stone Mountain in Two Decades.
- 2:31 115. MURPHY, J. C., J. MCCRIMMON AND C. B. McDONALD (North Carolina State University and East Carolina University). The Plant Communities and Flora of Bryant Mill Creek, Brunswick County, North Carolina.
- 2:44 116. DESELM, H. R., G. M. CLARK AND B. C. CONDLEY (University of Tennessee). The Great Valley and Central and Northern Blue Ridge National Nature Landmarks.
- 2:57 BREAK
- 3:10 117. DAY, F. P., JR. (Old Dominion University). Leaf Litter Decomposition Rates in the Great Dismal Swamp, Virginia.
- 3:23 118. LIEUX, M. H. (Louisiana State University). Pollen Analysis of Mississippi Honey Samples.
- 3:36 119. DELCOURT, H. R. AND D. C. WEST (Oak Ridge National Laboratory and University of Tennessee). Biomass Maps for Southeastern Arboreal Taxa.
- 3:49 120. HEIM, D. E. AND R. R. SHARITZ (Savannah River Ecology Laboratory). Reproductive Strategies of Cattails Under Increased Environmental Temperatures.
- 4:02 121. CROPPER, W. P., JR. AND H. L. RAGSDALE (Emory University). The Distribution and Mobility of Lead in Phloem of *Ailanthus altissima*.

- 4:15 122. SCHMALZER, P. A., C. R. HINKLE AND H. R. DESELM (University of Tennessee and Science Applications, Inc.). The Vegetation of a Section of the Obed River Gorge, Cumberland County, Tennessee.
- 4:28 123. DELCOURT, P. A. AND H. R. DELCOURT (University of Tennessee). Vegetation Maps for Eastern North America: Full-Glacial to Present.
- 4:41 124. DE LA CRUZ, A. A. AND C. T. HACKNEY (Mississippi State University and University of Southwestern Louisiana). Effects of Three Management Techniques on Primary Productivity of Two Tidal Marshes in Mississippi.
- 4:54 125. SHABICA, S. V. (Coastal Field Research Laboratory, National Park Service). Off-road Vehicle Impacts on Coastal Ecosystems: Grasslands.

PARASITOLOGY, SESSION II

Holt Hall, Room 124

Presiding: Dr. Raymond E. Kuhn and Gerald W. Cassida, Wake Forest University

- 1:00 126. CUNNINGHAM, D. S. AND R. E. KUHN (Wake Forest University). Suppression of Humoral Responses in Mice Infected with *Trypanosoma cruzi*.
- 1:13 127. YONGUE, W. H., JR. (Virginia Polytechnic Institute and State University). Recovery of Cytotoddia (= *Toddia*) in Northern Water Snakes from a Cytotoddia-Free Inoculated White Rat.
- 1:26 128. BUXTON, BONNIE (Auburn University). Isolations of *Dirofilaria immitis* from Alabama mosquitoes.
- 1:39 129. SAKAS, P. S. AND W. L. CURRENT (Auburn University). *Dirofilaria immitis*: Serological Response of Beagles Throughout the Course of Infection.
- 1:52 130. CURRENT, W. L. (Auburn University). *Henneguya adiposa* (Myxosporidia) in the Channel Catfish: Ultrastructure of the Plasmodium Wall and Sporogenesis.
- 2:05 131. MOBLEY, R. W. AND M. M. BROWNE (North Carolina State University). Antennal Structures of Several Species of Bird Lice.
- 2:18 132. LINDSAY, M. G. (Louisiana State University). Dynamics of *Fasciola hepatica* Infected Snail Populations.
- 2:31 133. GARRETT, H. B., II AND D. S. DUNDEE (University of New Orleans). Two New Monogenetic Trematodes (Gyrodactylidae) from Louisiana Cyprinodontoid Fishes and a Redescription of *Gyrodactylus hargisi* Williams and Rogers, 1971.
- 2:44 134. LEEDOM, W. S. AND R. B. SHORT (Florida State University). A New Dermatitis Producing Schistosome Cercaria From the Apple Snail, *Pomacea paludosa*.
- 2:57 BREAK
- 3:10 135. ATKINSON, K. H. (Florida State University). Protein Synthesis During Development of *Schistosoma mansoni*.
- 3:23 136. CONTOS, N. AND R. B. SHORT (Florida State University). E. M. Observations on Sensory Papillae of *Schistosomatium douthitti* Cercariae.
- 3:36 137. BOETTCHER, P. A. AND K. C. CORKUM (Louisiana State University). Some Trematode Parasites of Louisiana Crayfishes.
- 3:49 138. LOTZ, J. M. AND K. C. CORKUM (Louisiana State University). Population Biology of Host-parasite Associations: Interaction of the Hydrobiid Gastropod, *Annicola peracuta*, with a Community of Larval Trematodes.
- 4:02 139. PATTON, S., M. D. MCCracken AND K. S. MARBURY (University of Tennessee). The Occurrence and Effect of *Thelazia* (Spiruroidea) in Horses.
- 4:15 140. SHIH, CHAI-FANG AND A. B. WEATHERSBY (University of Georgia). The Effects of Extracts of *Culex pipiens* on Exogenous *Plasmodium gallinaceum* in *Aedes aegypti*.
- 4:28 141. BOOKER, K. A. AND W. H. YONGUE, JR. (Virginia Polytechnic Institute and State University). A Survey of the Incidence of an Intraerythrocytic Parasite, Cytotoddia (= *Toddia*), in *Natrix sipedon sipedon* on Garden Island, Michigan, and in a Small Area of Southwestern Virginia.
- 4:41 142. SMITH, C. J. AND K. C. CORKUM (Louisiana State University). The Usefulness of a ⁵¹Cr Release Cytotoxicity Assay to Determine Depression of a Cell Mediated Immune Response by *Dipetalonema viteae*.

ANIMAL PHYSIOLOGY, SESSION II

Signal Mountain Room, University Center

Presiding: Dr. Marion Wells, Middle Tennessee State University

- 1:26 143. ERVIN, G. AND M. WELLS (Middle Tennessee State University). Characterization of Thrombocytes from Intact and Bursectomized Chickens by Application of the "Chromium Assay."
- 1:39 144. DODD, L. AND M. WELLS (Middle Tennessee State University). The Effect of Bursectomy on ATPase activity in Chicken Thrombocytes.

- 1:52 145. WRIGHT, M. I. AND K. B. DAVIS (Memphis State University). Effect of Acclimation Temperature on Malate Dehydrogenase Activity in Channel Catfish, *Ictalurus punctatus*.
- 2:05 146. TOMASSO, J. R., M. I. WRIGHT, B. A. SIMCO AND K. B. DAVIS (Memphis State University). Effects of Calcium Chloride and Sodium Chloride on the Inhibition of Nitrite Induced Methemoglobinemia in Channel Catfish, *Ictalurus punctatus*.
- 2:18 147. SMITH, M. J. (Millsaps College). Hematological Response of Mirror Carp (*Cyprinus carpio*) and Rainbow Trout (*Salmo gairdneri*) to One Week of Extreme Hypoxia.
- 2:31 148. PAV, D. I., J. L. ROBERTSON AND F. J. ALSOP (East Tennessee State University and Kingsport University Center). Development of Epiphyseal Plates in Long Bones of Pharaoh Quail.
- 2:44 149. LARRICK, S. R., D. S. CHERRY AND J. CAIRNS, JR. (Virginia Polytechnic Institute and State University). Participation of Central Nervous System Anesthetics in the Cold Shock Syndrome of Freshwater Fish.
- 2:57 150. SHAHEEN, C. AND W. B. KEITH (University of Mississippi). Determinations of Cardioactive Principles in the Venom of *Bufo americanus* with ^3H -Cholesterol.
- 3:10 151. SHAHEEN, C. AND W. B. KEITH (University of Mississippi). Spectrofluorometric Determinations of Catecholamine Levels in The Hognose Snake, *Heterodon*.
- 3:23 152. GRESHAM, P. A. AND W. B. KEITH (University of Mississippi). ^3H Cortisol Binding By Mouse Thymocytes: Relationship to Gonadectomy and Thymic Involution.
- 3:36 153. KIMBROUGH, T. D., G. C. LLEWELLYN, K. REYNOLDS AND N. COATS (Virginia Commonwealth University). The Effects of Tryptophan and Protein Deficient Diets on Animals Exposed to Mycotoxins.

CYTOLOGY AND GENETICS, SESSION II

Holt Hall, Room 116

Presiding: Dr. Priscilla S. Rushton, Memphis State University

- 1:26 154. BORTNER, S. A. AND P. S. RUSHTON (Memphis State University). Effects of X-rays on the Mitotic Rhythm in Mouse Bone Marrow.
- 1:39 155. WOLDEYESUS, Y. AND A. L. WILLIAMS (Murray State University). Studies of a Valine-Resistant Mutant of *Escherichia coli* K-12.
- 1:52 156. CAFFEY, W. J. AND SR. G. M. FLICKINGER (Xavier University). Ethnic Variation In Palmar Flexion Creases Frequencies.
- 2:05 157. FLICKINGER, SR. G. M. AND C. BRADFORD (Xavier University). A Comparison of a-b Ridge Counts Within and Between Three Ethnic Groups.
- 2:18 158. FLICKINGER, SR. G. M. AND A. JONES (Xavier University). Ethnic Variation in High Frequencies of Similar Digital Patterns.
- 2:31 159. SMITH, M. L. AND G. W. KALMUS (East Carolina University). The Role of Methyl Groups in Differentiation of Cardiac Tissue in Cultured Chick Embryo Explants.
- 2:44 160. RYALS, P. E., H. E. SMITH AND H. E. BUHSE, JR. (University of Alabama and University of Illinois, Chicago). Development of the Cytopharyngeal Pouch During the Transformation of the Ciliate, *Tetrahymena vorax*.
- 2:57 161. SCOTT, W. T. AND H. E. SMITH (University of Alabama). Stereological Studies of Ventricular Myocardial Cells During Postnatal Development of the Rat.
- 3:10 162. HOFFMANN, G. R., R. KIRVEN AND L. MORRISON (Meredith College). Measurement of Changes in the Frequencies of Haploid and Merodiploid Cells in Bacterial Populations Exposed to Mutagenic Agents.
- 3:23 163. ADKISON, L. R., W. A. WEPPNER AND J. H. COGGIN, JR. (University of South Alabama). Suppression of Lymphocyte Reactivity to SV40 Transformed Cells by Pregnant Hamster Spleen Cells.
- 3:36 164. BATH, D. W., K. HASHIMOTO AND T. KANZAKI (Austin Peay State University and Memphis V.A. Hospital). Cytogenetic Analysis of Human Malignant Melanoma Cells *In Vitro*.
- 3:49 165. CUNNINGHAM, P., R. DANIEL, D. ABBOTT AND C. ROTHE (Murray State University). Effects of Delta-9-Tetrahydrocannabinol on Growth and Metabolism of Microorganisms.

WORKSHOP: TEACHING METHODS

Conference Rooms 2 and 3, University Center

Presiding: Dr. William J. Koch, University of North Carolina

1:00-2:00

166. Teaching Large Classes Humanistically (Effectively).

FRIDAY MORNING — APRIL 27

ICHTHYOLOGY AND HERPETOLOGY, SESSION III

Grote Hall, Room 129

Presiding: *Dr. Arthur C. Echternacht*, University of Tennessee

- 8:00 167. MATHESON, R. H., III (National Marine Fisheries Service). Certain Aspects of Age and Growth of Speckled Hind, *Epinephelus drummondhayi*. Life History of the Slackwater Darter, *Etheostoma boschungii*.
- 8:13 168. LEGRANDE, W. H. (University of Wisconsin, Stevens Point). The Role of Chromosomal Rearrangements as Isolating Mechanisms in *Noturus*.
- 8:26 169. ZEHREN, S. J. (University of Alabama, Birmingham). Osteology and Evolutionary Relationships of the Zeiform Family Caproidae.
- 8:39 170. LUCKNER, C., L. MADSEN AND A. DOUCETTE (Louisiana State University). Karyology of the Northern Gulf of Mexico Poeciliidae.
- 8:52 171. CASHNER, R. C., F. L. PEZOLD AND J. M. GRADY (University of New Orleans). A Preliminary List of the Fishes of Clark Creek in Western Mississippi, with a New Record for the Southern Redbelly Dace, *Phoxinus erythrogaster*.
- 9:05 172. NIELAND, D. L. (University of Tennessee). Fishes of the Duck River.
- 9:18 173. BOSCHUNG, HERBERT (University of Alabama). Notes on the Distribution and
- 9:31 174. WALKER, H. J., JR. AND F. M. TRUESDALE (Marine Ecological Consultants and Louisiana State University). Ichthyoplankton Survey of Nearshore Gulf Waters Off Southeastern Louisiana, July, August and December, 1973.
- 9:44 175. WILSON, L. D. (Miami-Dade Community College). The Dry-Forest Herpetofauna in Honduras: Composition, Distribution, and Dispersal.
- 9:57 176. WYGODA, M. L. (University of Florida). Terrestrial Activity of Striped Mud Turtles, *Kinosternon baurii*.
- 10:10 177. DODD, C. K., JR. (U.S. Fish and Wildlife Service). The Use of Photography to Estimate the Numbers of Tadpoles in Shallow Breeding Ponds.
- 10:23 178. WALTER, ROHN (Brevard Community College). Demographic Control of *Anolis carolinensis*.
- 10:36 179. WYLIE, P. E. (East Carolina University). Geographic Variation in the Bahamian Brown Anole, *Anolis sagrei*.

AQUATIC ECOLOGY, SESSION III

Grote Hall, Room 131

Presiding: *Dr. Clay Chandler*, Middle Tennessee State University

- 8:00 180. BRAGG, M. B. AND C. M. CHANDLER (Middle Tennessee State University). A Preliminary Survey of Benthic Macroinvertebrates in a Recently Impounded Reservoir.
- 8:13 181. GRAHAM, R. D., JR. (Middle Tennessee State University). A Survey of the Benthic Macroinvertebrates in Percy Priest Reservoir.
- 8:26 182. SUAREZ, M. J. HENCH AND C. E. WICKSTROM (Emory University). The Distribution and Characterization of a Pigmented Bacterium.
- 8:39 183. WICKSTROM, C. E. (Emory University). Nitrogen Fixation by Bluegreen Algae in Hot Springs.
- 8:52 184. KIRBY, J. M. (Virginia Polytechnic Institute and State University). Food Resource Partitioning Among Four Species of Sunfish.
- 9:05 185. CLARK, J. R., J. CAIRNS, JR. AND K. L. DICKSON (Virginia Polytechnic Institute and State University and North Texas State University). Methods for ATP Extraction — A Review.
- 9:18 186. HENEBRY, M. S., D. L. KUHN, J. L. PLAFKIN, D. J. CAIRNS AND K. M. HART (Virginia Polytechnic Institute and State University). Effects of Pollution on Protozoan Communities Inhabiting Artificial Substrates in the South River, Virginia.
- 9:31 187. CAMERON, J. T. AND C. B. COBURN, JR. (Tennessee Technological University). Differences in Community Structure of Periphyton at Two Levels in Two Ponds in Western North Carolina.
- 9:44 188. SHIPP, L. P. (Dauphin Island Sea Lab and University of Alabama). The Distribution of Decapod Crustacean Larvae Within a Brackish Marsh of the Northern Gulf of Mexico.
- 9:57 189. CATHEY, D., G. M. SIMMONS, W. YONGUE AND B. C. PARKER (Virginia Polytechnic Institute and State University). The Benthic Microfauna of Eight Antarctic Dry Valley Lakes.
- 10:10 190. SWEENEY, J. W., E. L. MORGAN AND G. LARSON (Tennessee Technological University and Upland Fields Laboratory, Great Smoky Mountains National Park). Popu-

- lation Structure of Pure and Sympatric Rainbow and Brook Trout in Selected Streams of the Great Smoky Mountains National Park.
- 10:23 191. ARWAY, J. A., W. F. PORAK AND E. L. MORGAN (Tennessee Technological University). Response of Benthic Macroinvertebrate Communities to Sodium Hydroxide Neutralization of Acid Receiving Streams.
- 10:26 192. SEAGLE, H. H., JR., G. H. MOSER AND H. T. CRAVEN (Virginia Polytechnic Institute and State University). The Continuing Effects of an Abandoned Mine on the Ecology of a Small Stream in Southwest Virginia.

PLANT ECOLOGY, SESSION II

Chattanooga Room A, University Center

Presiding: Dr. Richard Stalter, St. John's University

- 8:00 193. STALTER, RICHARD (St. John's University). The Plant Communities of Cape Island, Charleston County, South Carolina.
- 8:13 194. WICKLAND, D. E. (Savannah River Ecology Laboratory and University of North Carolina). *Lygodium palmatum* (Schizaeaceae), a Heavy Metal Accumulator from North Carolina.
- 8:26 195. JONES, J. D., G. T. WEAVER AND E. L. LEWIS (Southern Illinois University). Nutrient Concentrations in Sun and Shade Leaves of Nine Hardwood Tree Species in Southeastern Illinois.
- 8:39 196. MACKENZIE, M. D. AND P. A. ROBERTSON (Southern Illinois University). The Evaluation of Non-Metric Multidimensional Scaling for the Ordination of Discontinuously Sampled Coenoplans.
- 8:52 197. ROBERTSON, P. A. (Southern Illinois University). The Woody Vegetation of Little Black Slough, Johnson County, Illinois.
- 9:05 198. HERR, N. E. AND K. W. MCLEOD (University of California and Savannah River Ecology Laboratory). Leaf Water Relationships of *Nyssa aquatica* as Affected by Simulated Thermal Effluents.
- 9:18 199. FURRY, J. C. AND D. K. EVANS (Marshall University). Flora and Vegetation of Remnant Forests of the Ohio River Floodplain Between the Great Kanawha and Big Sandy Rivers, West Virginia.
- 9:31 200. TRAIN, ELIZABETH AND F. P. DAY, JR. (Old Dominion University). Population Age Structures of Tree Species Occurring in Four Plant Communities in the Great Dismal Swamp, Virginia.
- 9:44 201. SHERROD, C., JR. AND K. W. MCLEOD (Savannah River Ecology Laboratory). Long-Term Response of Baldcypress to Thermal Loading.
- 9:57 202. EICKMEIER, W. G. (Vanderbilt University). The Ecological Significance of Late-Season Phosphorus Redistribution in *Quercus prinus* L. and *Acer saccharum* Marsh in Central Tennessee.
- 10:10 203. OSTMAN, N. L. AND G. T. WEAVER (Southern Illinois University). Changes in Nitrogen Concentration in Foliage During Leaf Senescence.
- 10:23 204. BROWN, R. G. AND G. T. WEAVER (Southern Illinois University). Sulfate-Sulfur Inputs in Bulk Precipitation Stemflow and Throughfall as Affected by Forest-Type, pH of Precipitation and Season in Two Upland Illinois Ozark Watersheds.
- 10:36 205. HINKLE, C. R. AND H. R. DESELM (University of Tennessee). The Character of the Forest Vegetation on The Cumberland Plateau in Tennessee.

PLANT SYSTEMATICS, SESSION I

Holt Hall, Room 124

Presiding: Dr. Samuel B. Jones, University of Georgia

- 8:00 206. JONES, S. B. (University of Georgia). Chromosome Numbers of Veroniceae.
- 8:13 207. HARDIN, J. W. (North Carolina State University). Stellate and "Stellate" Trichomes and Stellate Vestiture.
- 8:26 208. MUIR, M. A. AND J. G. STUTTS (University of Georgia). Revision of *Piptocoma* Veroniceae).
- 8:39 209. STUTTS, J. G. (University of Georgia). Revision of *Pollalesta* Veroniceae).
- 8:52 210. BOOM, B. M. (University of Tennessee). Spore Ornamentation as a Useful Character in Delimiting *Isoetes* Taxa in the South-eastern U.S.
- 9:05 211. COILE, N. C. (University of Georgia). Floristics of Elbert County, Georgia.
- 9:18 212. WILKINSON, E. M. (Old Dominion University). Anatomy of *Parasitaxus ustus* (Podocarpaceae).
- 9:31 213. MOHLENBROCK, R. H. (Southern Illinois University). LaRue-Pine Hills: Queen of the Shawnee National Forest (Illinois).
- 9:44 214. DAVENPORT, L. J. (University of Alabama). Correlation of Selected Morphological Characters and Climatic Variables in *Potamogeton nodosus* (Potamogetonaceae).
- 9:57 215. JONES, R. L. (Vanderbilt University). The status of *Aster georgianus* (Asteraceae).

- 10:10 216. MATTHEWS, J. F. AND R. K. TEAGUE (University of North Carolina, Charlotte). The Hybrid Fern, *Pellaea x wrightiana* — A Problem of Establishment.
- 10:23 217. STUCKY, J. M. (North Carolina State University). A Practical Application of the Polyclave.
- 10:36 218. STUCKY, J. M. (North Carolina State University). A Karyotypic Study of *Ipomoea* (Convolvulaceae).

ANIMAL ECOLOGY, SESSION I

Signal Mountain Room, University Center

Presiding: Dr. J. Edward Gates, University of Maryland

- 8:00 219. GATES, J. E. AND D. M. HARMAN (University of Maryland). Habitat Characteristics of a Western Maryland White-Tailed Deer Winter Concentration Area.
- 8:13 220. LADINO, A. G. AND J. E. GATES (University of Maryland). Mammal Utilization of Transmission-Line Corridor and Adjacent Habitats.
- 8:26 221. THOMPSON, E. L. AND J. E. GATES (University of Maryland). Distribution and Breeding Site Characteristics of the Jefferson Salamander in Maryland.
- 8:39 222. CHASKO, G. G. AND J. E. GATES (University of Maryland). Avian Nesting Success Along Transmission-line Corridors in Western Maryland.
- 8:52 223. JESELNICK, D. L. AND I. L. BRISBIN, JR. (Savannah River Ecology Laboratory). Food Caching Behavior of Captive-Reared Red Foxes.
- 9:05 224. HUMPHREY, W. D. AND A. A. DE LA CRUZ (Mississippi State University). Benthic Macrofauna of Mississippi Tidal Marshes.
- 9:18 225. PINDER, J. E., III AND J. P. GIESY (Savannah River Ecology Laboratory). Comparisons of Frequency Distributions for Concentrations of Essential and Nonessential Elements in *Micropterus salmoides*.
- 9:31 226. BAUMAN, T. R. AND E. A. CROSS (University of Alabama). Respiration Responses of Adult *Tenebrio* to Cyclic Temperatures.
- 9:44 227. MCCORMICK, J. F. (University of Tennessee). Strategies for the Protection and Management of Riparian Ecosystems.
- 9:57 228. WILKINS, K. T. (University of Florida). Highway Mortality of Vertebrates in Eastern Texas.
- 10:10 229. SHABICA, S. V. (National Park Service, Coastal Field Research Laboratory). Sea Turtle Nesting at Cape Hatteras and Cape Lookout National Seashores.
- 10:23 230. SCHALLES, J. F. (Emory University). Ecology of Three Salamander Populations in a Carolina Bay Pond at the Savannah River Plant, South Carolina.

CRYPTOGAMIC BOTANY, SESSION I

Holt Hall, Room 116

Presiding: Dr. James G. Bruce, University of Georgia

- 8:00 231. BRUCE, J. G. (University of Georgia). Gametophytes of *Lycopodium flabelliforme* (Lycopodiaceae).
- 8:13 232. SYKES, E. E. AND D. PORTER (University of Georgia). Development of the Endoparasitic Water Mold, *Catenaria allomycis*, in *Allomyces arbuscula* (Blastocladales).
- 8:26 233. ORSER, J. A. AND G. E. DILLARD (Western Kentucky University). The Periphyton of Sloan's Crossing Pond, Mammoth Cave National Park, Kentucky.
- 8:39 234. DYLEWSKI, D. P. AND C. E. MILLER (Ohio University). Observations on the Development of *Woronina pythii* in Two-Member Host/Parasite Culture.
- 8:52 235. HAWKINS, J., G. L. BUTLER, J. C. O'KELLEY AND T. R. DEASON (University of Alabama). Inhibition of Algal Growth by UO_3 and UO_2 .
- 9:05 236. HANSEN, M. V. AND L. P. ELLIOTT (Western Kentucky University). Detection and Identification of *Clostridium perfringens* from the Barren River, Kentucky, Above and Below a Sewage Disposal Plant.
- 9:18 237. TRYBA, S. E. AND W. J. SUNDBERG (Southern Illinois University). Species-Aggregates of *Trichoderma* (Fungi Imperfecti) from the Palzo Strip Mine, Williamson County, Illinois.
- 9:31 238. GRIFFIN, D., III (University of Florida). The Genus *Breutelia* (Musi) in Mexico.
- 9:44 239. MORROW, A. C. AND T. R. DEASON (University of Alabama). Morphological Variation in Three Varieties of the Diatom Genus *Eunotia*.
- 9:57 240. HICKS, M. L. (Appalachian State University). Quadrat Studies of Hymenophyllaceae Populations and Their Bryophyte Associates in the Southern Appalachians.
- 10:10 241. BATES, V. M., JR. AND E. T. BROWNE, JR. (Memphis State University). Notes on the Sporocarps of *Azolla caroliniana*.

- 10:23 242. CAMPBELL, E. O., K. R. MARKHAM, N. A. MOORE, L. J. PORTER AND J. W. WALLACE (Massey University, Division of Scientific and Industrial Research, and Western Carolina University). A Chemical Approach

to the Taxonomy of the Marchantiaceae (Hepaticae).

- 10:36 243. WARD, BAILEY (University of Mississippi). Studies on CO₂ Limitation and Growth of Algae in Batch Cultures.

INVERTEBRATE ZOOLOGY

Holt Hall, Room 307

Presiding: Dr. Diane Nelson, East Tennessee State University

- 8:00 244. NELSON, D. R., C. HOWARD, C. WILLIAMS AND G. TUNNELL (East Tennessee State University). A Comparison of the Tardigrade Fauna in Pine and Oak Forests, Bays Mountain Park, Tennessee.
- 8:13 245. NELSON, D. R. (East Tennessee State University). A Phase and Scanning Electron Microscopic Study of *Echiniscus viridissimus* (Tardigrada).
- 8:26 246. NELSON, C. H. (University of Tennessee, Chattanooga). A New Genus and Species of Perlidae from The Great Smoky Mountains (Plecoptera).
- 8:39 247. CHESHIRE, J. M. AND P. E. LUTZ (University of North Carolina, Greensboro). Effects of Some Ecological Factors on a Late Summer Community of Adult Odonata with Special Reference to *Enallagma signatum*.
- 8:52 248. GOODEN, T. M. (Middle Tennessee State University). Occurrence and Seasonal Distribution of the Butterflies (Papilionoidea) in the Inner Central Basin of Tennessee.
- 9:05 249. MYSING-GUBALA, M. AND M. A. POIRRIER (University of New Orleans). The Effects of Cadmium and Mercury Upon Survival, Gemmulation and Gemmosclere Morphology in the Freshwater Sponge, *Ephydatia fluviatilis*.
- 9:18 250. VIDRINE, M. F. (University of Southwestern Louisiana). Water-mite Parasites of Amblesminine Fresh-water Mussels in North America.
- 9:31 251. ADKISON, D. L., T. S. HOPKINS AND J. K. SHAW (Dauphin Island Sea Lab). Notes on *Upogebia operculata* (Decapoda) from the Northeastern Gulf of Mexico.
- 9:44 252. JENNER, M. G. AND C. E. JENNER (University of North Carolina). Anomalous Sex Traits in Neogastropoda.
- 9:57 253. CLAMP, J. C. (North Carolina State Museum). Rediscovery of *Lagenophrys singularis* (Ciliophora).
- 10:10 254. WITHROW, C. P. (Marshall University). The Status of the *Apheloria-Rudiloria* Problem.
- 10:23 255. GOEKE, G. D. AND T. S. HOPKINS (University of South Alabama and Dauphin Island Sea Lab). Notes on Two Species of *Stenorhynchus* (Brachyura) in the Northern Gulf of Mexico.
- 10:36 256. DUOBINIS, E. M. AND C. T. HACKNEY (Mississippi State University and University of Southwestern Louisiana). Resistance to Desiccation, Growth Rate and Potential Predators of the Carolina Marsh Clam, *Polymesoda caroliniana*.

FRIDAY AFTERNOON — APRIL 27

ICHTHYOLOGY AND HERPETOLOGY, SESSION IV

Grote Hall, Room 129

Presiding: Dr. William H. Redmond, University of Tennessee

- 1:00 257. COX, W. A. AND K. R. MARION (Memphis State University and University of Alabama, Birmingham). Growth in the Musk Turtle, *Sternotherus minor*, in a North Florida Spring.
- 1:13 258. COX, W. A. AND K. R. MARION (Memphis State University and University of Alabama, Birmingham). Population Structure and Survivorship in the Musk Turtle, *Sternotherus minor*, in a North Florida Spring.
- 1:26 259. SMITH, C. S. AND G. G. MURPHY (Middle Tennessee State University). Procedural Inconsistencies in the Histological Examination of Reptilian Bone.
- 1:39 260. WYLIE, P. E., W. D. WEBSTER AND C. M. FUGLER (University of North Carolina, Wilmington). Community Structure of a Dry Season Bolivian Amphibian Fauna.
- 1:52 261. SEMLIUSCH, R. D. (Savannah River Ecology Laboratory). Age-Specific Growth in

- Populations of the Slimy Salamander, *Plethodon glutinosus*, from Maryland and Pennsylvania.
- 2:05 262. SCOTT, A. F. AND J. L. DOBIE (Austin Peay State University and Auburn University). Aquatic Movements of Farm Pond Populations of the Eastern Mud Turtle, *Kinosternon subrubrum subrubrum*, in East-central Alabama.
- 2:18 263. BLEM, C. R. AND W. H. N. GUTZKE (Virginia Commonwealth University). The Eastern Cottonmouth at the Northern Edge of Its Range: Morphometrics.
- 2:31 264. MIDDENDORF, G. A. AND C. A. SIMON (University of Tennessee and American Museum of Natural History). Thermoregulatory Aspects of Temporal Resource Partitioning in the Lizard, *Sceloporus jarrovi*.
- 2:44 265. ROBERTSON, J. L., D. I. PAV AND JING-MAY CHEN (East Tennessee State University). Growth Rates of Some Visceral Organs in Six Species of Salamanders.
- 2:57 266. McMILLAN, MICHAEL (Savannah River Ecology Laboratory). Life History Aspects of the Dwarf Salamander *Eurycea quadridigitata*.
- 3:10 267. KEATON, G. H., J. L. GREENE AND J. W. GIBBONS (Savannah River Ecology Laboratory). Terrestrial Orientation and Directional Fidelity of Turtles.
- 3:23 268. NUNGESSER, M. K. (Savannah River Ecology Laboratory). Terrestrial Movement Patterns of Aquatic Turtles Between Neighboring Bodies of Water.
- 3:36 269. SEYLE, C. W., JR. AND S. E. TRAUTH (Auburn University). A Preliminary Report on a Herpetological Survey of the Fall Line Hills Sandhills of Western Georgia.
- 3:49 270. COWIE, R. J., D. I. PAV AND JING-MAY CHEN (East Tennessee State University). Comparison of Brain Growth in *Desmognathus welteri* with Selected Plethodontid Species.

AQUATIC ECOLOGY, SESSION IV

Grote Hall, Room 131

Presiding: Dr. Donald Tarter, Marshall University

- 1:39 271. CHAFFEE, D. L. AND D. C. TARTER (Marshall University). Life History and Ecology of *Baetisca bajkovi* Neave in Beech Fork of Twelvepole Creek, Wayne County, West Virginia.
- 1:52 272. TOLBERT, V. R. AND G. L. VAUGHAN (University of Tennessee). Effects of Strip-mining Erosion on Benthic Insects.
- 2:05 273. SICKEL, J. B. (Murray State University). Reevaluation of the Asiatic Clam Population In the Altamaha River, Georgia.
- 2:18 274. DUNDEE, D. S. (University of New Orleans). The Effects of Organotin Antifoulants on the Environment.
- 2:31 275. HONIG, R. A. AND A. L. BUIKEMA, JR. (Virginia Polytechnic Institute and State University). Usefulness of Nontaxonomic Structure of Periphyton to Assess Effects of a Simulated Refinery Effluent.
- 2:44 276. LIDEN, L. H., D. T. BURTON, S. L. MARGREY AND L. H. BONGERS (Benedict Estuarine Research Lab and Martin Marietta Corporation). Comparative Biototoxicity of Bromochlorinated and Chlorinated Power Plant Condenser Cooling Waters to Selected Estuarine Organisms.
- 2:57 277. HALL, L. W., JR., S. L. MARGREY, D. T. BURTON AND L. H. LIDEN (Benedict Estuarine Research Lab). The Effect of Chlorine, Temperature and Exposure Duration on Juvenile Blue Crabs and Grass Shrimp.
- 3:10 278. MARGREY, S. L., L. W. HALL, JR. AND D. T. BURTON (Benedict Estuarine Research Lab). Combined Effects of Chlorine, Temperature and Exposure Duration on Larval White Perch.
- 3:23 279. BURTON, D. T., L. W. WALL, JR. AND S. L. MARGREY (Benedict Estuarine Research Lab). Chlorine, Temperature and Exposure Duration Interaction on Eggs and Prolarvae of the Striped Bass.
- 3:36 280. GIATTINA, J. D., S. R. LARRICK, D. S. CHERRY AND J. CAIRNS, JR. (Virginia Polytechnic Institute and State University). A Comparison Between Field and Laboratory Determined Chlorine Avoidance Thresholds for Two Cyprinids, *Notropis galacturus* and *N. spilopterus*.
- 3:49 281. GRANEY, R. L., D. S. CHERRY, J. H. RODGERS, JR. AND J. CAIRNS, JR. (Virginia Polytechnic Institute and State University and East Tennessee State University). Behavioral and Lethal Responses of the Asiatic Clam to Cu, Zn, Cu-Zn and K Exposures.
- 4:02 282. MARTIN, W. W. (Randolph-Macon College). The Effects of Fungal Parasites on Populations of Midges in Virginia.
- 4:15 283. DECHANT, T. AND J. WEST (Western Carolina University). Relationships Between the Intragravel Environment and Hatching Success, Emergence and Dry Weight of Salmonid Embryos in the South Mills River Drainage Basin.
- 4:27 284. STIREWALT, H. L., M. E. TRUETT, S. M. THIGPEN, R. G. THOMAS, R. R. HERRING AND B. M. SAUL (Augusta College). Some Effects of Rechannelization on the Aquatic Organisms in the Coastal Plain Region of the Savannah River.
- 4:40 285. HARVEY, R. S. (Savannah River Laboratory). Recolonization of Reactor Cooling Water System by the Asiatic Clam.

PLANT ECOLOGY, SESSION III

Chattanooga Room A, University Center

Presiding: Dr. Joe E. Winstead, Western Kentucky University

- 1:39 286. HURT, V. K. AND J. E. WINSTEAD (Western Kentucky University). Ecotypic Differentiation of *Andropogon virginicus* L. (Poaceae) and Strip-Mine Spoil Banks.
- 1:52 287. QUINN, M. AND W. H. MARTIN (Eastern Kentucky University). Composition and Diversity in Successional and Stable Forest Communities at Lilley Cornet Woods, Letcher County, Kentucky.
- 2:05 288. HUNT, E. J. AND D. J. SHURE (Emory University). Mechanisms of Vegetation and Arthropod Responses to Chronic Waste-water Irrigation.
- 2:18 289. DEW, K., J. N. SKEEN AND H. L. RAGSDALE (Emory University). Comparison of Understory and Canopy Species Association Patterns in Mature Piedmont Deciduous Forests.
- 2:31 290. HULL, J. C. AND R. C. SCOTT (Towson State University). Observations on Revegetation of Debris Avalanches of the Blue Ridge Mountains.
- 2:44 291. WHIPPLE, S. A. (Louisiana State University). Species Dispersion Patterns Within a Floodplain Hardwood Forest.
- 2:57 292. BAKER, C. C., JR., G. T. WEAVER AND P. A. ROBERTSON (Southern Illinois University). Herb Variability in an Old-Growth Bottomland Forest in Southern Illinois.
- 3:10 293. DEYOUNG, H. R. AND H. R. DESELM (University of Tennessee). The *Pinus strobus* Forest Vegetation Types of the Great Smoky Mountains National Park.
- 3:23 294. JONES, S. M. AND B. A. DUNN (Clemson University). Aspects of the Biology of *Shortia galacifolia* (Diapensiaceae).
- 3:36 295. GANT, R. E. AND E. E. C. CLEBSCH (University of Tennessee). The Role of Allelopathic Interference in the Maintenance of Southern Appalachian Heath Balds.
- 3:49 296. MACDONALD, M. E. AND K. MARION (University of Alabama, Birmingham). Effects of Time of Perturbation on Community Reproductive Strategies.
- 4:02 297. JACKSON, J. F. (University of Southwestern Louisiana). Seed Size as a Correlate of Temporal and Spatial Patterns of Seed Fall.
- 4:15 298. WHIGHAM, D. F. AND M. MCWETHY (Smithsonian Institution). The Reproductive Ecology of *Tipularia discolor* (Orchidaceae).
- 4:28 298A. CROWLEY, P. H. (University of Kentucky). Matrix Models of Succession and Precession.

PLANT SYSTEMATICS, SESSION II

Holt Hall, Room 124

Presiding: Dr. Robert R. Haynes, University of Alabama

- 1:00 299. HAYNES, R. R. (University of Alabama). *Potamogeton* Subsection *Perfoliati* in North America.
- 1:13 300. THOMPSON, R. L. (Southern Illinois University). Vegetation and Flora of Myrtle Island Research Natural Area, Douglas County, Oregon.
- 1:26 301. DORR, L. J. (University of North Carolina). Reproductive Biology and Pollination Ecology of *Zenobia* (Ericaceae).
- 1:39 302. ZETO, S. K. AND D. K. EVANS (Marshall University). A Study of Vascular Plants on Rock Outcrops in Southwestern West Virginia.
- 1:52 303. BOZEMAN, J. R. AND G. A. ROGERS (Georgia Department of Natural Resources and Georgia Southern College). Notes on the Endangered Georgia Endemic, *Elliottia racemosa* (Ericaceae).
- 2:05 304. BECKMAN, R. L. AND J. M. STUCKY (North Carolina State University). Pollination Biology of *Ipomoea pandurata* (Convolvulaceae).
- 2:18 305. BECKMANN, R. L. (North Carolina State University). Flavonoid and Pollen Studies in *Ipomoea* L. (Convolvulaceae).
- 2:31 306. WATSON, FRANCIS (North Carolina State University). *Taxodium*, One Species or Two?
- 2:44 307. BOSTICK, P. E. (Kennesaw College). Statistical Analysis of the Flora of the Carolinas.
- 2:57 308. SMITH, G. L. AND W. S. FLORY (Wake Forest University and University of Georgia). Indications of Apomixis in Zephyrantheae.
- 3:10 309. HUCK, R. B. (University of North Carolina). Vascular Flora of the Bull Creek Watershed, Osceola County, Florida.
- 3:23 310. PILATOWSKI, R. E. (North Carolina State University). A Preliminary Look at the *Hydrangea arborescens* Complex.
- 3:36 311. LANDRY, G. P. (Louisiana State University). A Preliminary Survey of the Genus *Zamia* (Cycadaceae) in Florida.
- 3:49 312. NICKRENT, D. L. (Old Dominion University). The Floral Biology of Witchweed

- (*Striga asiatica* (L.) Kuntze) (Scrophulariaceae).
- 4:02 313. MUSSELMAN, L. J. (Old Dominion University). Observations of *Striga* in Nigeria (Scrophulariaceae).
- 4:15 314. BOETTCHER, ROGER (Louisiana State University). A Systematic Study of the *Solidago sempervirens* L. Complex (Compositae).
- 4:28 315. MELLICHAMP, T. L. (University of North Carolina, Charlotte). *Aruncus dioicus* (Rosaceae), Foodplant of the Rare Dusky Blue Butterfly, *Celastrina ebenina* (Lycaenidae).
- 4:41 316. DRAPALIK, D. J., M. W. HOTCHKISS AND J. PAFFORD (Georgia Southern College). The Vascular Flora and Ecology of the Kennedy Tract, Bulloch County, Georgia.

ANIMAL ECOLOGY, SESSION II

Signal Mountain Room, University Center

Presiding: Dr. John A. Freeman, Winthrop College

- 1:39 317. FREEMAN, J. A. (Winthrop College). Effect of Thermal Shock on Upper Lethal Temperatures of the Guppy, *Poecilia reticulata* (Poeciliidae).
- 1:52 318. DUBAY, D. T. AND D. SHURE (Emory University). The Response of Decomposer Microarthropods and Their Environment to Secondary Succession on the Georgia Piedmont.
- 2:05 319. MOORE, D. W. AND M. L. KENNEDY (Memphis State University). Densities and Trap Related Activity Patterns of the Raccoon, *Procyon lotor*, in Western Tennessee.
- 2:18 320. TUTTLE, R. D., R. LINDAHL AND T. HOPKINS (University of Alabama). Genetic Differentiation in Three Sympatric Morphs of the Asteroid Genus *Othilia* (= *Echinaster*).
- 2:31 321. LEE, D. S., J. B. FUNDERBURG AND R. FRANZ (North Carolina State Museum and Florida State Museum). Ecological and Geographical Distribution of the Southeastern Pocket Gopher, *Geomys pinetis*.
- 2:44 322. RAGLAND, H. C. AND I. L. BRISBIN, JR. (Savannah River Ecology Laboratory). Roosting Patterns and Social Rank in Free-Ranging Bantam Chickens.
- 2:57 323. SCHUBAUER, J. P. (Savannah River Ecology Laboratory and S.U.N.Y. College, Buffalo). The Influence of Heated Effluents on Turtle Populations in Par Pond, South Carolina.
- 3:10 324. LANGLEY, A. K., JR. (Emory University). Effects of Regional Climatic Extremes on Old-Field Mammal Populations.
- 3:23 325. BRAUN, J. K., D. W. MOORE AND M. L. KENNEDY (Memphis State University). Hair and Its Taxonomic Use for Selected Mammals of Tennessee.
- 3:36 326. ROBSON, D. P. (Maryland Ornithological Society). Cooperative Soaring Strategies in Migrating Falconiformes: Observation from Light Aircraft.
- 3:49 327. GIBBONS, J. W. AND J. L. GREENE (Savannah River Ecology Laboratory). Reproductive Characteristics and Variation in Aquatic Turtles.

CRYPTOGAMIC BOTANY, SESSION II

Holt Hall, Room 116

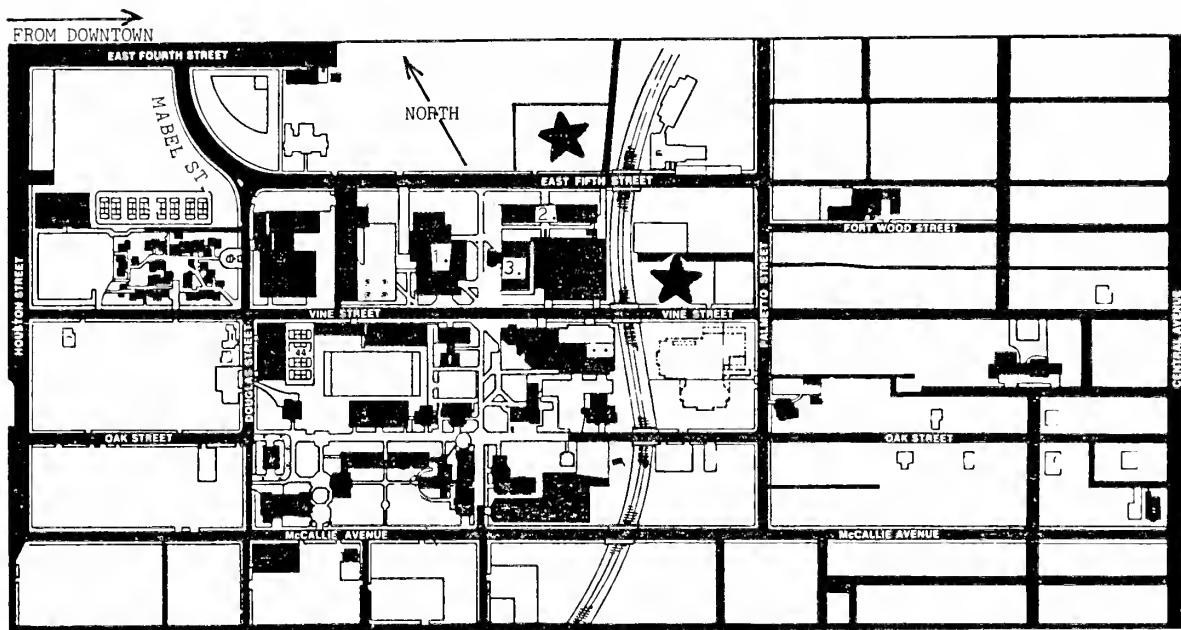
Presiding: Dr. Larry Elliott, Western Kentucky University

- 1:00 328. VANENK, R. A. AND L. P. ELLIOTT (Western Kentucky University). Isolation and Identification of Yeasts from the Barren River, Kentucky.
- 1:13 329. ZATTAU, W. C. AND T. MCINNIS, JR. (Clemson University). The Nutritional Requirements of *Leptolegnia* sp. (Oomycetes), A New Species of Mosquito Parasite.
- 1:26 330. RICHARDSON, E. R. AND L. A. DYCK (Clemson University). Indolic Hormones from *Chara zeylanica*.
- 1:39 331. LAWRENCE, J. E. AND L. A. DYCK (Clemson University). Ultrastructural Development of the Internodal Cells of *Chara australis*.
- 1:52 332. DEBRO, L. AND B. WARD (University of Mississippi). Antibacterial Activity from Freshwater Chlorophycean Algae.
- 2:05 333. BARRETT, M. R. (University of North Alabama). Effects of Ammonium Sulfate and Urea on the Growth of Five Species of Algae Isolated from Lowland Rice Cultures.
- 2:18 334. KELLER, H. W., L. FREDERICK, R. SIMONS AND L. PENDERGRASS (Wright State University, Howard University, Fernbank Science Center and United States Forest Service). Myxomycetes of Georgia: A Progress Report.
- 2:31 335. BOWERS, F. D. (University of Wisconsin, Stevens Point). The Occurrence of *Anomodon acutifolius* (Musci) in Mexico.
- 2:44 336. SPELCE, D. L. AND R. D. COFFIN (Old Dominion University). Aspects of Gametophyte and Sporophyte Development in *Isoetes riparia* (Lycopsidea).

- 2:57 337. RIGBY, F. P. AND L. FREDERICK (Howard University). Studies on Myxomycetes from Bark of Trees in the District of Columbia.
- 3:10 338. FRANCIS, N. A. AND R. L. PETERSEN (Howard University). Growth of Blue-green Algae with Myxomycete Plasmodia.

- 3:23 339. PETERSEN, R. L. AND D. ARNOLD (Howard University). Bioassays for Heavy Metal Contamination Based on Percent Spore Germination and Gametophyte Growth Rate (Filicinae).
- 3:36 340. Fox, N. C. (Vanderbilt University). Lipid Composition of the Oospores of the Aquatic Fungus, *Achlya*.

UTC CAMPUS MAP



REGISTRATION

1. UNIVERSITY CENTER

MAP CODE

MEETING SITES

1. UNIVERSITY CENTER
2. HOLT HALL
3. GROTE HALL

PARKING



Abstracts of Papers Presented at the 40th Annual Meeting of the Association of Southeastern Biologists

The number in parenthesis at the top of each abstract refers to the number of that paper in the Program.

(1)

Observations of Deep Water Reef Fishes of the Northern Rim of the DeSoto Canyon by Means of Research Submersible

ROBERT L. SHIPP

University of South Alabama

During June, 1978, the research submersible *Diaphus* made numerous dives on and around the northern rim of the DeSoto Canyon, located approximately 30 km S of Navarre, Florida. The rim was observed to be comprised of granular limestone blocks with numerous right angle joints. Associated with these structures were extensive populations of deep water reef fishes dominated by the Serranidae, Pomacentridae, Chaetodontidae, Priacanthidae, Apogonidae and Holocentridae. Many forms, previously unreported or rarely taken from the northern Gulf, were noted in abundance. Sand and mud bottom of little relief extended north and south of the rim and supported sparse populations of well-studied Gulf species.

(3)

Feasibility of Utilizing Scale Characteristics in the Identification and Keying of Western Atlantic Flatfishes

STAN R. HILL AND FRANK J. SCHWARTZ

Institute of Marine Sciences, University of North Carolina

An analysis of body scales from 50 species of flatfishes, families Bothidae (37), Paralichthyidae (5), Soleidae (5) and Cynoglossidae (3), which range in the western Atlantic Ocean from southwest Greenland to Venezuela, was conducted to determine the feasibility of identifying and ultimately keying out each scale to species. Scale characteristics were: position of focus, analysis of radii, analysis of circuli, presence of intermarkings, cycloid or ctenoid nature, analysis of apical and basal fields and length-width ratios. Scales were selected from four body regions, two each from blind and eyed sides, and studied by wet mount technique. Most species can be identified by a simple or group of specific scale characteristics. These will permit the development of a key to the specimens studied by scale appearance alone.

(2)

Trophic Partitioning in Four Species of Reef Fishes in Onslow Bay, North Carolina

TONY HARRIS AND DAVID G. LINDQUIST

East Carolina University and
University of North Carolina, Wilmington

Trophic partitioning studies were conducted on *Haemulon aurolineatum*, *Pareques umbrosus*, *Centropristis striata* and *Stenotomus aculeatus* inhabiting a rock outcrop in Onslow Bay. The study site is located 5 km east of Wrightsville Beach, N.C., in 15 m of water and occurs as a low overhanging ledge of Eocene limestone 80 m long with a maximum relief of 0.5 m. Selection of these species for study was based on preliminary population observations during the summer of 1977 using a visual censusing technique. Diver counts along a 50 m² strip transect revealed that these four species comprised approximately 90% of the standing summer fish crop (density) in the study area. Fish collections were made with the aid of SCUBA during 1976, 1977 and 1978 using quinaldine, ichthyocides, spearing, fish traps and hand nets. Gut analysis was conducted on all specimens. Topics to be discussed will include both intraspecific and interspecific trophic partitioning and overlap.

(4)

Caudal Peduncle Droop in Blueback Herring, *Alosa aestivalis*, from Cape Fear River, North Carolina

FRANK J. SCHWARTZ

Institute of Marine Sciences,
University of North Carolina

A bent caudal peduncle droop condition, resulting from a crushed/compressed caudal vertebra, was found in 23 blueback herring, *Alosa aestivalis*, caught in the Cape Fear River, North Carolina, 1975-1978. Nineteen of the deformed specimens (of 539 captured in 1978) were collected between May-June, 1978, from the west side of the river in the newly created intake canal of the Brunswick Steam Electric Plant, while four [July, 1975 (1); April, 1976, 1977 (2, 1)] were from channel stations 3-35 km north of Southport, North Carolina. Comparing the one and two year old (199-235 mm SL) deformed (B) to similar aged "normal" (N) specimens (53, range 119-246 mm SL, collected between 1970-1978), vertebral counts were: total B 47-50 (mean 49.0), N 45-51 (48.9), precaudal B 14-18 (16.2), N 14-18 (16.1) and caudal B 29-34 (32.4), N 29-35 (32.8). Deformed specimen caudal vertebral counts varied between 10/1 affected/23 and 17/1/16. Eight counts were 15/1/17. "Normal" appearing specimens do possess similar caudal vertebral deformities without an external evident caudal peduncle droop. Possible reasons are presented for the sudden appearance of afflicted blueback herring in the Cape Fear River.

(5)

Sampling of Reservoir Fish Populations in Littoral Areas with Rotenone

TOM J. TIMMONS AND W. L. SHELTON
*Cooperative Fishery Research Unit,
Auburn University*

W. D. DAVIES
*Agricultural Experiment Station,
Auburn University*

A method for sampling fish populations in the littoral area of reservoirs was developed to estimate the number and standing stock of young-of-the-year (YOY) and adult fishes in West Point Reservoir, Alabama-Georgia. A surface area of 0.01 ha was surrounded with a net (30.5 × 2.7 m), and the fish were poisoned with rotenone. The sample sites were chosen randomly by using a grid system. The average monthly standing stock (kg/ha) from April to September, 1977, ranged from 74.2 in September to 126.1 in June. The weekly samples yielded data that enabled us to estimate the reproductive success and time of spawning for many species. We determined a weekly mortality rate for YOY largemouth bass and could assess the availability of prey species. By using this method, we sampled a wider variety of habitats and collected more species (34) than were taken in large rotenone samples from coves (29) or by electrofishing (28) and provided a reasonable estimate of standing stock in shallow littoral areas. The technique required only two people and little specialized equipment.

(6)

Variation in Incubation Length of Loggerhead Sea Turtle (*Caretta caretta*) Clutches on the Georgia Coast

JED E. KRAEMER
University of Georgia

Seasonal variation in incubation length of loggerhead sea turtle clutches on the Georgia coast is determined. Variable climatic, hatchling and nest factors are examined regarding their relative influence on incubation length. Ambient sand temperature explains most variation within a season. Recent data indicate that seasonal variation in climatic factors temporally define nesting activity. Nesting of loggerhead sea turtles in other climatic regions is discussed.

(7)

Some Thoughts on Stoneroller Minnows (*Campostoma anomalum*: Cyprinidae)

JAMES P. BEETS AND NOEL M. BURKHEAD
University of Tennessee

Upon solicitation by the Tennessee Wildlife Resources Agency (TWRA), population and life history studies of *Campostoma anomalum* were conducted from five tributaries of the Tennessee River System in Carter, Johnson

and Unicoi Counties, Tennessee. This study is somewhat unique as it resulted from conflicts between two factions of the study area residents: those who fish for "hornyheads" as a food fish and those who seine large numbers of *Campostoma* for sale as bait in nearby reservoirs. Both fishing activities occur in the spring when *Campostoma* are spawning. Prior to this study, TWRA outlawed bait seining of *Campostoma* for resale within the study area resulting in an active "hornyhead" black market. Aspects of this fishery, population dynamics and life history will be discussed.

(8)

Movements of Shortnose Sturgeons, *Acipenser brevirostrum* (Acipenseridae), in the Altamaha River, Georgia

RONNIE J. GILBERT AND AMY R. HEIDT
University of Georgia

The shortnose sturgeon (*Acipenser brevirostrum*) is listed as endangered in the United States, Canada and the world. Effective conservation efforts for this species are hampered by lack of knowledge concerning its distribution, abundance and biology. Recently, shortnose sturgeons have been collected throughout the Altamaha River and in the Ocmulgee River, Georgia. Shortnose sturgeons were taken upstream during winter months and near the mouth of the river during the late spring, summer and fall. During summer months, shortnose sturgeons stay in deeper areas of the Altamaha River during the day and move to shallow tidal mud flats at night.

(9)

Short-term Stranding of Cyprinodontid Eggs

W. K. BRADLEY, JR.
Florida Technological University

Eggs of three *Fundulus* species and *Lucania parva* were subjected to two regimes of short-term stranding (<24 hrs) as well as constant submersion. Eggs of all four species were able to survive and hatch under all experimental conditions. *F. heteroclitus* hatched most successfully with two flooding cycles per day. *F. similis* appeared to require stranding for optimal development and survival. *F. grandis* hatched most successfully when flooded only once a day while more *L. parva* hatched when constantly submerged.

(10)

Variation in Reproductive Performance of the Livebearing Fish, *Poecilia latipinna*

FRANKLIN F. SNELSEN, JR.
Florida Technological University

Reproduction of the sailfin molly, *Poecilia latipinna*, is being investigated through field and laboratory approaches. The primary study region is on the central

east coast of Florida in the area of Cape Canaveral. Two populations from contrasting habitats were sampled monthly in 1973 and 1974. Females were measured and the ovarian contents classified and counted. The general pattern of reproduction is characterized by the following points: (1) reproduction typically begins in early April; (2) reproduction ceases in late October or early November; (3) females become sexually mature between 20-24 mm SL; (4) the number of young in a brood is positively correlated with size of the parent female and (5) there is considerable local and seasonal variation in reproductive performance.

Three features of reproductive performance are evaluated: percent of adult females pregnant, size of pregnant females and size-specific fecundity. These three measures interact in varying ways to influence the "replacement index," an overall measure of reproductive output.

(11)

Protein Variation and Genetic Differentiation in *Chologaster* (Pisces: Amblyopsidae)

DAVID L. SWOFFORD AND BRANLEY A. BRANSON
Eastern Kentucky University

Electrophoretic variation at 26 genetic loci was examined in populations of the spring cavefish, *Chologaster agassizi*, and the swampfish, *C. cornuta*. Polymorphisms were detected in phosphoglucumutase, phosphoglucose isomerase, glutamate-oxalate transaminase and isocitrate dehydrogenase. Levels of genetic variability within populations ranged from complete absence to mean heterozygosity estimates typical of vertebrates in general. Although mean genetic similarity (Nei's index) between conspecific *Chologaster* populations is comparable to values reported for other vertebrates, the degree of genetic differentiation between *C. cornuta* and *C. agassizi* is among the highest ever reported for congeneric vertebrate species. Possible explanations for the high level of genetic differentiation are discussed. Biochemical evidence does not support the contention of some authors that Illinois populations of *C. agassizi* should be considered a distinct species.

(12)

A Distinctive Madtom Catfish (Ictaluridae) from the Dan River, Virginia

WILLIAM J. MATTHEWS AND ROBERT E. JENKINS
Roanoke College and Virginia Commonwealth University

A distinctive madtom catfish was discovered during 1977 in a gorge cut by upper Dan River (Roanoke drainage) into the Blue Ridge escarpment in Patrick County, Virginia. Seven apparent adults and one juvenile have been collected by electrofishing. This madtom is closely related to the margined madtom, *Noturus insignis*, which ranges widely on the Atlantic slope, including the Dan system, and is native to the adjacent New River drainage. The Dan River gorge form differs from typical *N. insignis* in having the barbels, head, body (except belly) and all fins profusely, darkly spotted, and in the median fins having a less distinct dark margin. It also has more pre-anal vertebrae and fewer posterior serrae

on the pectoral spine than does typical *N. insignis*. All individuals taken from the gorge exhibit the distinctive coloration, but apparent intergrades with typical *N. insignis* have been collected above and below the gorge. All other species collected from the gorge had coloration typical of populations elsewhere in their ranges.

(13)

Seasonal and Daily Activity Patterns of the Glassy Darter, *Etheostoma vitreum* (Percidae)

DAVID S. LEE AND
RAY E. ASHTON, JR.

North Carolina State Museum

Adult Glassy darters, injected with cobalt-60 (35-50 microcurie) wires, were observed for 10 months in a 70 m section of a Piedmont stream in Wake County, North Carolina. Most activity was at dusk and dawn. These fish spent most of their time buried in sand, in or adjacent to the main stream channel, and emerged only to forage or when disturbed. Often the darters would remain for hours with only their eyes above the sand. Foraging periods normally lasted up to several hours, but, when frightened, the fish immediately burrowed. Individuals were nomadic, remaining in areas of approximately 1-1.5 m² for weeks, then migrating 20-40 m to establish another residence zone. The species appeared to be confined to those portions of the stream with a shifting sand substrate. Adults never entered pools, riffles or areas with silt or gravel bottoms. During cold weather and floods, darters commonly burrowed up to 30 mm into the sand.

(14)

Taxonomic Status of the Brook Trout in the Great Smoky Mountains National Park Based on Electrophoretic Data

ELIZABETH SHIPP, W. F. BRANDES AND J. W. HARRIS
Tennessee Technological University

A severe decline in both the number and range of the brook trout, *Salvelinus fontinalis* (Mitchill), in the Great Smoky Mountains National Park prompted this study designed to elucidate the taxonomic relationships which occur among various populations of this species. The genetic makeup of 40 allopatric populations of brook trout from eleven states and the Park was assayed by means of starch gel electrophoresis. Examination of 14 enzymes representing an estimated 29 genetic loci revealed only slight differences between the gene frequencies of the populations sampled. Use of the Rogers coefficient, a statistical test which compares each population to every other one for all loci examined, indicated no specific or sub-specific differentiation. Values generated by this test fell between 0.91 and 1.00, where a value of 1.00 represents total genetic identity. Reduced genetic variation was observed in brook trout collected from the Park, suggesting the possible effects of inbreeding. It is concluded that no significant genetic differentiation exists between brook trout from the Park and other brook trout populations examined.

(15)

Fishes of the Monongahela National Forest

S. A. PISTOLAS, C. H. HOCUTT AND J. R. STAUFFER, JR.
*Appalachian Environmental Laboratory,
University of Maryland, Frostburg*

A survey of the ichthyofauna of the Monongahela National Forest in West Virginia was performed in 1977-1978. Major drainages within the forest include Potomac, Monongahela and Kanawha River above (Greenbrier and Gauley Rivers) and below Kanawha Falls (Elk River). Collections (220) yielded 39,734 specimens, distributed among 78 species. Species of special concern are discussed.

(16)

Karyology of the Shads, *Dorosoma cepedianum* and *D. pretense* (Clupeiformes, Osteichthyes)

ALBERT J. DOUCETTE, JR. AND J. MICHAEL FITZSIMONS
Louisiana State University

Chromosome microslides of the two species of *Dorosoma* were prepared from hemopoetic and gill tissue with hypotonic citrate and squash techniques. Shad karyotypes are compared with those few reported for other clupeiforms. The implications of karyology in interpreting teleost phylogeny is discussed.

(17)

Additional Notes on Tropical Reef Fishes in the Carolinas with Zoogeographic Considerations

H. M. ANDERSON, T. H. HANDSEL AND D. G. LINDQUIST
*Institute of Marine Sciences, University of North Carolina;
North Carolina Marine Resources Center and
University of North Carolina, Wilmington*

Recent collecting efforts for fishes from the Carolinas have revealed a number of species which have not been recorded from the region or are known from only a limited number of observations. These range extensions are a result partly from stray or migrant individuals, but some, no doubt, represent indigenous faunal components. Specimens were collected by hook and line and SCUBA in conjunction with spears, ichthyocides, narcotizing agents and hand nets. Records and range extensions are given for *Paraconger caudilimbatus* (Congridae); *Anthias nicholsi*, *Epinephelus cruentatus* and *Schultztea beta* (Serranidae); *Anisotremus surinamensis* and *Haemulon striatum* (Pomadasysidae); *Pomacanthus paru* (Pomacanthidae); *Halichoeres pictus* (Labridae); *Labrisomus nuchipinnis* (Clinidae); *Quisquilius hipoliti* (Gobiidae) and *Scorpaena dispar* (Scorpaenidae). Specimens are deposited in the UNC-Wilmington fish collection. An analysis of the zoogeographic affinities of the reef fishes of the Carolinas is presented.

(18)

Squamation of the Bluegill, *Lepomis macrochirus*, in Early Life and Its Relationship to Age and Growth Studies

WILLIAM F. HUDSON AND FRANK J. BULOW
Tennessee Technological University

Postlarval, juvenile and adult bluegills were collected from a middle Tennessee lake. Postlarval and juvenile fish were stained with alazarin red to observe the chronology of scale pattern development. Scale samples collected from three distinct body regions of each adult bluegill were used for comparisons of body-scale relationships and age-growth analyses. Data analysis included these comparisons plus a study of relationships with chronology of scale pattern development.

(19)

Feeding, Growth and Competitive Interrelationships of *Morone chrysops* and *M. mississippiensis*

B. T. JAMES, F. J. BULOW AND M. J. VAN DEN AVYLE
Tennessee Technological University

Samples of adult white bass, *Morone chrysops* (Rafinesque), and yellow bass, *M. mississippiensis* Jordan and Eigenmann, were collected monthly from Watts Bar Reservoir, Tennessee, from January through November, 1978. The two species were compared by means of age and growth analysis, stomach content analysis, liver-somatic index and gonosomatic index. Weekly collections of young-of-year white and yellow bass from distinct habitats were used to determine habitat preferences and possible competition for food and space. Results of this study are presented along with a discussion of possible competitive interrelationships.

(20)

Some Sublethal Effects of *Posthodiplostomum* *minimum* on *Lepomis macrochirus*

FRANK J. BULOW AND RICKYE D. ANDERSON
Tennessee Technological University

One hundred bluegills, *Lepomis macrochirus*, were collected from a middle Tennessee lake within a 24 hr period in August to study sublethal effects of the strigeoid trematode, *Posthodiplostomum minimum*, on the bluegill. Epaxial muscle RNA-DNA ratio, coefficient of condition (K_{TL}), liver-somatic index, hematocrit and growth rate by the scale method were determined for each fish. Total counts of white grubs per liver were made using a plexiglas tissue press. This paper presents the results of this study and an analysis of possible relationships.

(21)

Macroinvertebrate Communities of a Lower Mississippi River Floodplain Slough

PHILIP C. DOWNEY AND JOHN V. CONNER
Louisiana State University

Macroinvertebrate communities of Needle Lake, a segment of a Mississippi River floodplain slough (Alligator Bayou) near St. Francisville, La., were studied from June, 1976, through May, 1977. Apparatus and procedures were developed for the quantitative sampling of coarse herbaceous vegetation and natural woody (snag) substrates. Representatives of 70 families from six phyla were identified and tentatively grouped into four communities which, in descending order of relative densities of animals were: open-water benthos; back-water benthos; log (snag) community; cutgrass community. The open-water benthos was the least diverse and was dominated by oligochaetes (especially tubificids) and dipteran larvae (especially *Chaoborus* and chironomids). Back-water benthos was dominated by chironomids, oligochaetes and isopods. Logs were colonized primarily by chironomid larvae. The taxonomically richest assemblage was associated with emergent *Zizaniopsis miliacea*. Amphipods, isopods, gastropods, oligochaetes and several insect groups were all numerically important (with complex seasonal patterns) in the cutgrass community.

(22)

Spring and Summer Macroinvertebrate Drift in the Lower Mississippi River, Louisiana

AKOLISA OBI AND JOHN V. CONNER
Louisiana State University

Macroinvertebrate drift was sampled dielly each month at three stations across the lower Mississippi River near St. Francisville, La., April-August, 1977. At least 134 taxa were identified from seven phyla; taxonomic richness varied temporally and spatially but seemed unrelated to overall drift densities. Dipterans (especially *Chaoborus* and certain chironomid pupae), mayflies and caddisflies (mainly hydropsychids) dominated the catches. Important non-insect groups were hydroids, oligochaetes, pelecypods (young *Corbicula*) and amphipods. Whereas it reflected general qualitative similarity with the local substrate-oriented fauna, the drift constituted a distinctive assemblage in quantitative terms. Temporal and spatial variation in drift catches seemed related, in complex ways, to both physical factors and behavioral/life-history phenomena. Diel periodicity was most evident during months of relatively high drift densities (June, August), coinciding with abundance peaks of burrowing mayfly nymphs (especially *Tortopus primus* and *Pentagenia vittigera*). Amplitude of diel fluctuations was greater in less turbulent stations.

(23)

Sediment Accumulation in Lake Chicot, Arkansas

J. C. RITCHIE, J. R. MCHENRY, C. M. COOPER AND
F. R. SCHIEBE

USDA-SEA-AR, National Program Staff and
Sedimentation Laboratory
Beltsville, MD and Oxford, MS

Lake Chicot is an oxbow lake located along the western side of the Mississippi River in southeastern Arkansas. A major flood in 1927, levee construction, land use changes to allow more agriculture and changes in drainage patterns have changed the appearance of the lake. The lake often has high suspended sediment concentrations making it undesirable for recreation and aquatic production. As part of a coordinated study, sediment samples were collected to determine the sediment deposition patterns. Major sediment accumulation is occurring near the inlet and along the outside of the oxbow. Average accumulation of 1.8 cm/yr since 1963 was measured for 12 samples. These rates would fill the lake in 200 years. Currently, construction is underway to bypass the lake with some of the sediment laden waters. Hopefully, this will reduce sediment input and improve the quality of the lake.

(24)

The Responses of Blue Crabs (*Callinectes sapidus* Rathbun) to Laboratory Thermal Gradients

CHRISTIAN M. HOBERG
Law Engineering Testing Company

Thermal preferences, avoidances and sensitivities of adult-male, intermolt blue crabs, *Callinectes sapidus* Rathbun, (N = 52) from Biscayne Bay, Florida, were quantified with a linear, 275 l, plexiglass-fronted thermal gradient table (500 × 50 × 29 cm). Individual crabs were exposed to standing, steep thermal gradients (20-40 C range) and upward and downward gradient shifts for 2 days. After acclimation to 28 C for 5 days, the crabs exhibited a mean thermal preference (expressed as a 15 min settle) for 31.2 ± 0.58 C on the first day compared to 30.2 ± 0.58 C on the second day (27 C overnight acclimation for 12 hrs). Crabs preferred a statistically constant ($P \leq 0.05$) temperature three consecutive times, despite gradient shifts. A mean upper thermal avoidance of 37.0 ± 0.70 C (28 C acclimation) and 35.8 ± 0.64 C (27 C acclimation) and a thermal sensitivity to slight (≤ 0.5 C average range) and shifting gradients were also exhibited. Data were verified by controls, insuring responses to temperature as opposed to laboratory background conditions.

(25)

Rotifers as Indicators of Domestic Pollution

DARRYAIL W. WHITTINGTON AND LUTHER A. KNIGHT, JR.
Mississippi Air and Water Pollution Control Commission
and University of Mississippi

A limnological study of 5 creeks in the Little Tallahatchie watershed in northern Mississippi was conducted from April, 1976, through October, 1977, to determine

if rotifers may be used as indicators of domestic pollution. Seventeen genera of rotifers were arranged in groups according to density. Rotifer, fecal coliform and selected physico-chemical data were analyzed by computerized analysis of variance and correlation analysis with the Statistical Package for the Social Sciences (SPSS). The analyses revealed that the 5 stations were not significantly different in values of D.O., pH, water temperature, free carbon dioxide and fecal coliforms. Data were arranged into 5 groups according to genera density, and analysis of variance (ANOVA) was performed to check for goodness of fit into each group. Analysis of variance showed significant differences between the groups. Correlation analyses performed for each group using density of rotifers and fecal coliform ratings showed no significant differences from zero. Three of the groups of rotifers of the 5 analyzed by correlation analysis showed potential as indicators of domestic pollution in the creeks.

(26)

Comparison of a New Artificial Substrate Sampler with Other Benthic Sampling Techniques

DEEDEE KATHMAN

Associated Water and Air Resources Engineers, Inc.

ERIC L. MORGAN

Tennessee Technological University

A recently described artificial substrate sampler for benthic invertebrates in ponds, small lakes and reservoirs was compared to three other benthic sampling techniques: Petite Ponar, Hester-Dendy multiplate and modified barbecue basket. Ten artificial substrate samplers of each type were simultaneously placed in Tumbling Creek, Polk County, Tennessee, and left to colonize by the benthos for time periods of 30 and 60 days. At times of artificial substrate retrieval, 10 Petite Ponar samples were taken in close proximity to the other samplers. Hester-Dendy, Ponar and modified barbecue basket samplers were comparable in both total numbers of organisms and numbers of taxa per sample, while the new enclosed sampler showed a substantial increase in total numbers of organisms and numbers of taxa for both colonization periods. These findings could be attributed to preferable substrate conditions for colonization or prevention of organism wash-off and escape during retrieval.

(27)

Effects of BaCl_2 , CuCl_2 , MnCl_2 , NiCl_2 and $\text{Pb}(\text{NO}_3)_2$ on the Growth of Intact Seedlings of *Triticum vulgare* cv Arthur

VERNA R. LAWSON AND GLENDA D. KNOX

Bethune-Cookman College

Intact wheat seedlings 1-10 days old, grown on a sterile solid incubation medium, exhibit varying responses to divalent metal ions associated with exhaust emissions. Ba and Pb solutions produce changes varying from slight enhancement to strong inhibition while concentrations of Mn ion show little, if any, effect on the seedlings. Ni and Cu solutions cause increasing inhibition as concentration increases. Combinations of 10^{-4}M Mn with varying concentrations of Pb produce effects ranging from

slight to marked growth enhancement. Mixtures of Cu and Ni ions produce less growth inhibition than observed with either ion alone.

(28)

Effects of NiCl_2 and CuCl_2 on Growth of Apical Coleoptile Segments of *Triticum vulgare*

VERNA R. LAWSON AND GLENDA D. KNOX

Bethune-Cookman College

As the concentration of NiCl_2 and CuCl_2 increases from one $(1) \text{ M}$ to $5 \times 10^{-5}\text{M}$, the amount of inhibition increases. The optimal concentration of IAA is $25 \times 10^{-6}\text{M}$, over a concentration range of $75 \times 10^{-5}\text{M}$ to $1 \times 10^{-6}\text{M}$. When segments are placed in optimal IAA plus varying concentrations of NiCl_2 and CuCl_2 ($5 \times 10^{-1}\text{M}$ to $1 \times 10^{-5}\text{M}$), NiCl_2 prevents enhancement of elongation due to IAA. When the concentration of NiCl_2 or CuCl_2 is kept constant at $1 \times 10^{-5}\text{M}$, a concentration which permits growth equivalent to that in water, and the concentration of IAA varies from $75 \times 10^{-5}\text{M}$ to $1 \times 10^{-5}\text{M}$, growth is equivalent to that in IAA alone. 2,4-D promotes growth of segments similar to IAA, except that low concentrations of 2,4-D promotes growth to a greater degree than does similar low concentrations of IAA ($1 \times 10^{-5}\text{M}$ to $5 \times 10^{-6}\text{M}$). The optimal concentration of 2,4-D is $5 \times 10^{-5}\text{M}$. The same type of concentration effect with NiCl_2 or CuCl_2 is evident when 2,4-D is used instead of IAA. Growth of apical segments in either GA_3 or H_2O is similar. In the presence of $10 \times 10^{-5}\text{M}$ NiCl_2 and GA_3 , the growth of the segments is the same as that in NiCl_2 alone.

(29)

Flavin Compounds as Agents for the Photooxidation of Plastocyanin in Blue Light

J. W. ROSS, J. K. HARDMAN AND J. C. O'KELLEY

University of Alabama

An action spectrum for cell division in *Protosiphon botryoides* has indicated that blue light inhibits and longer wavelength visible light promotes division. A crude protein preparation indicated the presence of a photoreversible pigment system in this organism that changed from a blue absorbing form to a long wavelength-absorbing form, and the reverse.

This study indicated that one component of the active system is a flavoprotein and another is the copper protein plastocyanin. Upon irradiation with blue light, flavoprotein is reduced and reduced plastocyanin is oxidized. The reaction is not specific for the *Protosiphon* flavoprotein, and free flavins are also active. Of the free flavins tested, FMN has highest activity; flavoproteins from other sources have activity with FMN-containing proteins more active than those that contain FAD. The reaction requires oxygen because it involves the formation of singlet oxygen which appears to be the agent oxidizing plastocyanin. The reverse reaction in long wavelength light, wherein plastocyanin is reduced and flavin is oxidized, has not been demonstrated using free flavins or flavin mononucleotides. The active *Protosiphon* flavoprotein is currently being characterized and purified to determine if it will reduce plastocyanin in long wavelength light. Supported by NSF grant BMS 7522783.

(30)

Reversal of Hormone Stimulated Pea Epicotyl Elongation by Concanavalin-A and Bacitracin

B. P. STONE AND W. H. ATKINSON
Austin Peay State University

IAA and GA enhancement of pea epicotyl elongation was inhibited by Concanavalin-A. The Con-A inhibition of hormone stimulated elongation was nullified by mannose suggesting a mannose specific receptor for hormone stimulation. Bacitracin, an antibiotic which inhibits incorporation of mannose into glycoprotein, was an effective inhibitor of hormone-enhanced pea epicotyl elongation. Hormone enhanced chemiluminescence in pea epicotyl sections will be discussed.

(31)

Environmental Factors and Aflatoxin Occurrence in Shelled Peanuts

R. H. JOHNSON, C. E. O'REAR AND G. C. LLEWELLYN
Virginia Commonwealth University and
George Washington University

Peanuts are an important agricultural product used for both human food and animal feed. Virginia-produced nuts are generally of high quality and low in contaminants. However, a group of toxic and carcinogenic agents resulting from the fungal growth of *Aspergillus flavus* has been detected in peanuts and other stored products. Since November, 1964, the levels of aflatoxins in samples of shelled peanuts from Virginia farms have been monitored by the State of Virginia. The data from nearly 10 years of such monitoring have been summarized. The study finds 2 major monthly peaks of aflatoxin occurrence. One peak corresponds to May and the other to November. A conducive temperature range of approximately 7 to 23 C — in the previous month — and a need to look at the climatological factors of the previous month to glean the most information are found. A model for predicting aflatoxin levels based purely on month has been developed during the course of analysis. This is based on a complex sine function of month.

(32)

Investigation of Plant Hormones in the Green Alga, *Pediastrum tetras* (Chlorophyta)

ROBERT CREEK
Eastern Kentucky University

Although most of the studies on the presence of plant hormones have been with higher plants, investigations during recent years have indicated that microorganisms produce substances that have biological activity similar to that of known plant hormones. This study was undertaken to determine whether the green alga, *Pediastrum*, produced any hormone-like substances during its growth. The investigation thus far, using various plant bioassays, chromatography and GLC, has indicated that a gibberellin-like substance is produced by this organism. Continued investigation will determine whether other plant hormones are present.

(33)

An Electrophoretic Study of *Spartina alterniflora* Organs, Individuals and Populations

DANTON L. JOHNSON
College of Charleston

Tillers, roots and stem bases of *Spartina alterniflora* were analyzed electrophoretically to determine the extent of enzyme variation. Twelve different enzymes were analyzed using three different starch-gel electrode buffer systems. Tiller and stem base isozyme patterns were consistent regardless of collection site, salinity, substrate, growth form or plant age. Some variations were found in root isozymes of Px, IPO and ADH. It would appear that most of the enzymes studied were the result of a single gene locus and that most of the loci were homozygous. Supported by EPA Grant #R-804-688-01.

(34)

Effect of Storage on Germination of *Spartina alterniflora*

DANTON L. JOHNSON
College of Charleston

The single seeded fruits of *Spartina* were stored either wet (filtered estuarine water, $S = 26\text{‰}$) or dry (in plastic bags) at 5 C. Tall form *Spartina* seeds were viable after ten months of storage (wet: 85% and dry: 60%). The short form seeds exhibited about 50% germination stored wet, but dry storage resulted in 0% germination. Material collected the third week in October exhibited the best germination. Cold-dry storage depressed the final germination percentage but did not affect the log phase of germination rates or percentages. It was noted that the percentage of embryos present decreased from a mid- to late-October high of about 30% to a mid-November low of about 10%. Supported by EPA Grant #R-804-688-01.

(35)

Distribution of Free and Bound Tritiated Water in *Pinus taeda* L.

JEFFREY C. LUVALL AND CHARLES E. MURPHY, JR.
Savannah River Ecology Laboratory and
Savannah River Laboratory

Distribution of free and bound tritiated water was determined for seven year old *Pinus taeda* L. trees growing on sandy-loam soils at the Savannah River Plant near Aiken, South Carolina. Each tree received 1 ml of tritiated water (1×10^8 dpm activity) volumetrically pipetted into each of three 0.5 cm $\times$ 2 cm holes and sealed. On each tree, three branch ends were covered with clear plastic bags from which condensation was collected for counting. Twigs and needles were also collected and moisture extracted by freeze-drying. Unbagged branches were sampled from the same whorl by collecting needles and twigs and moisture extracted by freeze-drying. The effects due isotopic mass differences and a comparison of methods are also discussed. Samples were oven vacuum dried and combusted to determine the bound fraction.

(36)

Haustorial Initiation in Witchweed (*Striga asiatica*; Scrophulariaceae)

R. E. EPLEE

USDA, Whiteville Methods Development Laboratory

Germinated witchweed seeds produced the early stages of haustorial development when treated with an alcoholic extract of gum tragacanth. Root hair production near the radicular apex was comparable *in vitro* to hairs induced by natural hosts such as sorghum and maize. Seedlings treated with the extract and placed in contact with *Phaseolus vulgaris* roots both attached to and penetrated the host stele. These data suggest one possible phase in the development of witchweed where host recognition is exercised.

(37)

Experimental Induction of Haustoria in the Root Parasite, *Agalinis purpurea* (Scrophulariaceae)

JAMES L. RIOPEL AND JOHN STEFFENS
University of Virginia

Developmental regulation of the haustorium in the hemi-parasite, *Agalinis purpurea*, is different than for other root organs in that an exogenous stimulus triggers initiation. Parasite plants growing in sterile culture without host roots form very reduced numbers of haustoria. When presented with host root or host root exudate, haustoria are rapidly initiated in 12-24 hrs. Attachment is effected in 2-3 days. The haustorial inducing component is present in root exudates in many species. It is high and low temperature stable. Purification has proved difficult because inducing activity is diminished during concentration procedures, and the active molecules bind irreversibly to several of the gel matrices used in column and thin-layer chromatography. In progress studies indicate reactive groups may be small glycosides. Alcoholic extracts of gum tragacanth also induce haustoria. Exposure to the exudate for as short a duration as 6 hrs produces some haustoria and a 24 hr treatment results in a response equal to continuous exposure to host exudate.

(38)

Effects of Gamma Radiation on Oviposition and Fertility of *Dermanyssus gallinae* (DeGeer) (Acari:Dermanyssidae) Irradiated as Unfed Protonymphs

DEBORAH L. ENTREKIN AND JAMES H. OLIVER, JR.
Georgia Southern College

Dermanyssus gallinae irradiated as unfed protonymphs at 1, 3 and 6 krad of gamma radiation were unable to successfully mate and/oviposit. Males treated with 0.50 and 0.75 krad were able to successfully stimulate females to oviposit; however, sperm injury was evident at the 0.75 krad level and above.

(39)

Control Critical Anthelmintic Evaluation of Mebendazole Against Induced and Naturally Occurring Helminth Infections in Cats

C. E. LONDON, E. L. ROBERSON AND J. W. MCCALL
University of Georgia

Mebendazole, a broad-spectrum anthelmintic, was found to have efficacies of 100, 99 and 77% against the feline helminth parasites, *Toxocara cati*, *Ancylostoma tubaeforme* and *Taenia taeniaeformis*, respectively. Of 51 cats with naturally occurring infections of *T. cati* and induced infections of *A. tubaeforme* and *T. taeniaeformis*, 20 were unmedicated control cats while 31 were treated with a paste formulation of mebendazole in a regimen of 22 mg/kg/day $\times$ 3 days. Feces were collected daily and necropsy was performed 14 days after the first treatment. Drug toxicosis was not evident in any of the cats nor was there any drug related change in feces consistency.

(40)

Comparative Effects of Different Modes of Administration of Thienium Closylate Against Hookworm Infections in Dogs

R. FLYNN NANCE AND E. L. ROBERSON
University of Georgia

There was no difference in the efficacy of thienium closylate (Canopar) for hookworms of dogs when the drug was given by label instructions (single treatment without fasting) as compared with fasting and splitting the dose. Fifty-six dogs harboring *Ancylostoma caninum*, *Uncinaria stenocephala*, or both species of hookworms were grouped according to weight, i.e., 4.5-13.6 kg and 14.1-27.3 kg. Each weight group had 4 subgroups of 7 dogs (5 treated and 2 controls). Parallel subgroups from each weight range received treatment as follows: 1) fast overnight, treat with a single 500-mg tablet, feed 2 hrs later; 2) fast overnight, treat with a 250-mg tablet twice, 6 hrs apart, feed 2 hrs after each dosing; 3) feed and treat with a single 500-mg tablet within 30 minutes and 4) feed and treat within 30 minutes with a 250-mg tablet twice, 6 hrs apart. The tablets were administered orally. The results indicate that the weight of the animal has a greater effect on the efficacy of the drug than fasting and/or splitting the dose. Although the difference was not statistically significant, the average efficacy of thienium closylate against *A. caninum* in the combined subgroups of smaller dogs was 92.9% while in larger dogs, 84.5%.

(41)

Response of *Diplostomulum scheuringi* Cercariae to Mosquitofish Conditioned Water in Agar Blocks

J. W. CAMP, JR., M. C. MONDL AND G. W. ESCH
Wake Forest University

Conditioned water was obtained by placing two male, two female or a male and female *Gambusia affinis* into

separate containers of filtered, aged tap water for 24 hrs. Difco Bacto agar was prepared in distilled water. When the agar reached 42 C, 10 ml of each type of conditioned water was added to 40 ml of agar. Control agar was made by adding distilled water. Truncated pyramids were cut from the agar. Cercarial contacts with agar blocks were counted in ten minute observation periods. Ten trials were conducted for each type of block with 20 cercariae per trial. Cercariae contacted blocks containing male conditioned water or male-female conditioned water significantly more times than control blocks or blocks containing female conditioned water. Cercarial contacts on male-female conditioned blocks were also significantly greater than contacts on male conditioned blocks. *Supported in part by Contract EY-76-S-09-0900 between Wake Forest and DOE.*

(42)

Phototactic Responses by Cercariae of *Diplostomulum scheuringi*

M. C. MONDL, J. W. CAMP, JR. AND G. W. ESCH
Wake Forest University

The phototactic response of *Diplostomulum scheuringi* was studied. Experiments were conducted in a clear, lucite chamber subdivided into five equal sections by removable partitions. From one end, the chamber was illuminated horizontally with a Leitz slide projector to which an infrared absorbing filter and a "hot" mirror were attached. Light was further modified to the desired wavelength using thin, film filters. For each trial, fifty light-adapted cercariae were introduced into the middle section of the chamber and the partitions then removed. Trials were run for varying lengths of time, and the partitions were replaced. Cercariae recovered from the section closest to the light source were considered positively phototactic, while those in the section most distant to the light source were considered negatively phototactic. The cercariae exhibited negative phototaxis with approximately 44% being recovered in the distant section of the chamber. *Supported in part by Contract EY-76-S-09-0900 between DOE and Wake Forest.*

(43)

An Ultrastructural Analysis of *Dipetalonema viteae* (Nematoda) in Its Vector, *Ornithodoros tartakovskyi* (Arthropoda)

M. D. ROGERS, J. A. BUTTS AND W. A. PHILLIS
University of North Carolina, Charlotte

Development of *Dipetalonema viteae* in its vector host, *Ornithodoros tartakovskyi*, was studied *in situ* using transmission electron microscopy. Arrangement of the worms while in the intracellular phase of development was noted. Electron micrographs revealed a possible mode of nutrition involving absorption of tick muscle. Observed cytopathological effects of the worm in tick muscles appeared to be a result of this absorption.

(44)

Trypanosoma cruzi: Role of Macrophages and Lymphocytes in Immunological Memory

DONALD E. BURGESS AND WILLIAM L. HANSON
University of Georgia

Both serum (Hanson, 1976, *Immun. Para. Inf.*, 222; McHardy, 1977, *Tropenmed. Parasitol.* 28:2:195) and cells (Roberson and Hanson, 1974, *Roy. Soc. Trop. Med. Hyg.* 68:4:338) can transfer protection against *Trypanosoma cruzi* in laboratory animals. Although the primary immune response to *T. cruzi* appears to be modulated by the thymus (Roberson, et al., 1973, *Exp. Parasitol.* 34:2:168), the cellular elements responsible for the adoptive transfer of protection remain unidentified. For this reason, studies were initiated to examine the protective activity of various cell types. Experiments in this laboratory have shown that peritoneal macrophages and splenic lymphocytes from infected C57BL/6J mice are protective to infected, syngeneic recipients. The ability of splenic lymphocytes to transfer this immunity is ablated by treatment with rabbit-anti-theta serum plus complement prior to transfer into infected, thymectomized, lethally irradiated animals. Thus, the resistance afforded by immune spleen cells appears to be largely T-cell dependent. The results of ongoing studies to examine the contribution of immunoglobulin-bearing immune lymphocytes to this immunological memory will also be reported.

(45)

Experimental Infection of Chick Embryos with *Naegleria fowleri*

BRENDA W. PARKER AND THOMAS W. HOLBROOK
Medical University of South Carolina

Naegleria fowleri was isolated from cerebrospinal fluid of an 8 year-old Caucasian male by intranasal inoculation in mice. Amebae from mouse brain were infective for chick embryos by implantation on the chorioallantoic membrane (CAM), inoculation into the chorioallantoic fluid or by intravenous injection. As few as 10 amebae inoculated on the CAM produced a disseminated infection in several organs and invariably resulted in deaths of embryos. Neither cysts nor flagellated forms were seen in tissues. CAM implantation of amebae killed 9-day embryos within 5 days, but most 16-day embryos infected at the same time survived to hatch and died later (up to 3 days after hatching, 8 days after infection). Following more than 20 serial passages in chick embryos, *N. fowleri* has maintained the ability to convert to a biflagellate form *in vitro* and produces infection in mice after intranasal inoculation. *Supported by the South Carolina Appropriation for Biomedical Research.*

(46)

The Effects of Actinomycin-D on the Ultra-structure of *Schistosoma mansoni* Schistosomules Grown In Vitro

BURTON J. BOGITSH
Vanderbilt University

Schistosomules of *Schistosoma mansoni* were produced by the skin penetration procedure. One group of schistosomules was treated with actinomycin-D (50 µg/ml) for one hr, fed mouse red blood cells and maintained in culture for a total of 15 days. Another group was used as controls. Following this period of time, it was observed that the treated schistosomules were motile but apparently did not feed on the red blood cells as determined by the lack of pigment in the gut. In excess of eighty % of the control worms fed on the red blood cells.

Ultrastructural investigations of the gastrodermis of the treated group revealed a loss of ribosomes and a "blebbing" of the luminal surface. The rough endoplasmic reticulum of the esophageal cells of the treated worms was whorled but the ribosomes were retained. Autoradiographic studies revealed that the actinomycin-D was uniformly distributed throughout the body of the organism. The significance of these findings will be discussed in light of what is known about feeding in these worms. Supported, in part, by a grant from the Clark Foundation.

(47)

Microfilaricidal Activity of Avermectin B_{1a} Against *Litomosoides carinii*

J. W. MCCALL, PAMELA HO AND JUNG JUN
University of Georgia

Avermectins B_{1a} and B_{2a} have been shown to have potent activity against both the microfilariae and developing larvae of *Dirofilaria immitis* (Blair and Campbell, *J. Parasitol.*, In Press; Blair and Campbell, *Am. J. Vet. Res.*, In Press; Campbell and Blair, *J. Helminthol.*, In Press). The present study was undertaken to evaluate avermectin B_{1a} for activity against the microfilariae of *Litomosoides carinii* and the adults of *L. carinii* and *Brugia pahangi* in combined infections in Mongolian jirds (*Meriones unguiculatus*). The drug was given orally in single daily doses of 1 and 2 mg/kg/day for 5 days. After 4 days of treatment at both levels, mean microfilarial counts had dropped to near negative values. Just prior to necropsy 54 days later, microfilaremias had increased to about one-tenth the pretreatment levels. Lack of adulticidal activity was evidenced by similar mean percent recoveries of adults in the test and control groups.

(48)

Coccidia (Protozoa:Eimeriidae) of Wild Hogs from Great Smoky Mountains National Park, Tennessee

BRUCE E. WHEAT AND WILLIAM J. COOK
University of Illinois and
Great Smoky Mountains National Park

In a survey from June 20 to August 24, 1978, 14 fecal samples obtained from necropsy of wild boar and wild

boar × feral swine hybrids from Great Smoky Mountains National Park, Tennessee, were examined for parasites by sugar flotation. Of the 14 samples, 85.7% were positive for *Eimeria* spp. oocysts, 42.8% positive for *Oesophogostomum* spp. ova and 50.0% positive for *Ascaris suum* ova. The *Eimeria* spp. identified from the swine were *E. deblickei*, *E. neodeblickei*, *E. cerdonis* and *E. scabra*. These species were confirmed by transmission into domestic swine.

(49)

Spatial Aspects of Helminth Communities of Cotton Rats

E. LYNN TALTON AND G. C. MILLER
North Carolina State University

The helminth community occurring in the gastro-intestinal tract of cotton rats, *Sigmodon hispidus hispidus* Say, from North Carolina was studied. *Longistriata adunca*, *Mastophorus muris ascaroides*, *Raillietina bakeri* and *Hymenolepis diminuta* were found commonly in the rats. The spatial aspects of community structure were determined by examining the distributions of the helminths in ten equal sections of the small intestine of individual rats. Preliminary observations indicate that there is a pattern of distribution in which the nematodes are located anterior to the cestodes. In most instances there is very little overlap in the species distributions.

(50)

Parasites of Some Fishes from Hyco Lake, North Carolina

STEPHEN P. DAY AND GROVER C. MILLER
North Carolina State University

Two hundred ten fishes of four families were examined between May and October, 1978, for parasites. The host species consisted of six centrarchids, five ictalurids, one percoid and one clupeid. Thirty species of parasites were recovered including helminths and parasitic copepods.

Clavunculus bifurcatus from *Lepomis cyanellus*, *Cleidodiscus floridanus* from *Ictalurus nebulosus* and *Urocleidus variabilis* from *Lepomis gibbosus* are apparently new host records. *Mazocraeoides olentangiensis*, *Pseudacanthocotyloides banghami* and *Ergasilus clupeidarum* from *Dorosoma cepedianum* are new locality records.

(51)

The Acute Effects of Cadmium on Kidney and Gill of the Teleost, *Leiostomus xanthurus* (Sciaenidae)

L. G. TATE, W. E. HAWKINS, C. A. FOSTER AND
T. G. SARPHEE
University of South Alabama
and
Gulf Coast Research Laboratory

The acute effects of cadmium on the kidney and gill of the marine teleost, *Leiostomus xanthurus*, were examined. Fish were exposed to concentrations of the

metal ranging from 1-25 ppm for 48 hrs. Tissue accumulations were monitored by flameless atomic absorption spectrophotometry. Noteworthy histopathological responses were observed in the kidney of animals exposed to concentrations of 10 ppm or higher. At these concentrations the proximal tubular epithelium exhibited responses ranging from heterogenous body formation to sloughing of cells. Mitochondria in the degenerating cells were compacted or contained precipitates in their matrices. Glomeruli were not affected although Bowman's space was enlarged at exposure concentrations above 10 ppm. Over the same exposure concentrations the gill did not exhibit the marked histopathological changes seen in kidney. Chloride cells showed some swelling but no mitochondrial damage was apparent.

(52)

Reduced Hepatic Tryptophan Oxygenase Activity in Xanthopterin Treated Rats

L. B. WEEKLEY, MICHAEL JONES AND T. D. KIMBROUGH
Virginia Commonwealth University

Xanthopterin (2-amino, 4,6-dihydroxypteridine) is a close structural analogue of xanthine and tryptophan, substrates for xanthine oxidase and tryptophan oxygenase, respectively. Allopurinol, a standard competitive inhibitor of both xanthine oxidase and tryptophan oxygenase, was studied for its effects on hepatic tryptophan oxygenase and compared with the effects of xanthopterin. Male rats were treated with either xanthopterin or allopurinol and hepatic tryptophan oxygenase activity was measured. The results suggest that xanthopterin may serve as a competitive tryptophan oxygenase inhibitor equal in effectiveness to allopurinol.

(53)

Possible Modification of the Hepatic Tryptophan 2,3 Dioxygenase Apoenzyme-Cofactor Bond by Aflatoxin

S. C. SHAFER, L. B. WEEKLEY, MIKE WEAVER,
T. D. KIMBROUGH AND G. C. LLEWELLYN
Virginia Commonwealth University

A number of studies have implicated aflatoxin altering tryptophan oxygenase activity and inducibility. In this study male Holtzman rats were fed 7.8 ppm dietary aflatoxin for a five month period, at which time hepatic holoenzyme tryptophan oxygenase activity was measured. This activity was reduced in the aflatoxin treated animals which suggests a possible pathophysiologic disorder of tryptophan metabolism in aflatoxin treated rats. The histopathology of the aflatoxin treated animals showed characteristic signs of aflatoxin toxicity. The animals displayed extensive bile duct proliferation and fatty degeneration of the liver. These results when compared with previous studies strongly suggest modification of the tryptophan 2,3 dioxygenase apoenzyme-cofactor bond by dietary aflatoxin.

(54)

The Subnuclear Array of Neuron Perikarya in the Hypoglossal Nucleus of *Mus musculus* as Revealed by the Retrograde Axonal Transport of Horseradish Peroxidase

CHARLES R. THOMAS AND FELIX H. LAUTER
University of South Carolina

The intrinsic and extrinsic lingual muscles of one to three day old mice were selectively injected with a solution of horseradish peroxidase (HRP). After axonal uptake and retrograde axoplasmic transport of the enzyme, the animals were sacrificed and serial frozen sections cut from the brain stem. The sections were then developed by reacting them with a suitable substrate in the presence of hydrogen peroxide. This produced a visible reaction product in the cells containing HRP. A careful light and dark field microscopic examination of the tissues followed, and motor neurons of the hypoglossal nucleus containing a brown to black precipitate were plotted on a coordinate graph. The subnuclear distribution of HRP positive cells was then compared with the specific peripheral fields to which the efferent fibers of this nerve pass.

(55)

Differential Effects of a Steroidal and a Non-steroidal Estrogen Upon Uterine Responsivity

G. A. NEWMAN AND P. S. CAMPBELL
University of Alabama, Huntsville

The early and late uterine growth responses to different doses of diethylstilbestrol (DES) or estradiol (E_2) were monitored in the 21 day old rat with respect to nuclear retention of the receptor-estrogen complex. The degree to which DES promoted greater long-term growth than E_2 paralleled the percent increase in nuclear retention of DES over E_2 . The increased sensitivity of the uterine growth response to DES with age also appears reflected in the increased differential nuclear retention of DES over E_2 noted with increasing age. However, the disparity in the early uterine response (water imbibition) promoted by DES or E_2 did not exhibit an apparent relationship to the quantity of nuclear receptor-hormone complex. Additionally, glucose oxidation by uterine tissue could be stimulated by E_2 at a dosage at which DES was ineffective, and maximal glucose oxidation required a dose of DES which was 25% greater than the minimal dose of E_2 producing this effect. The differential action of DES and E_2 upon several uterine parameters appears to be related to differences in nuclear retention of the two hormones and to differences that the two hormones may have upon uterine blood flow and/or membrane permeability.

(56)

Metabolic Profiles of Individual Human Mammary Tumors

ELIZABETH H. LARNER AND CHARLES L. RUTHERFORD
*Radford College and
Virginia Polytechnic Institute and State University*

Individual human fibroadenomas and infiltrating ductal carcinomas have been characterized for the purpose of

resolving potentially distinguishing features of malignancy. To this end, histological procedures were used in conjunction with microchemical techniques in order that the enzymatic profiles developed be specifically pertinent to tumor cell activity. Enzymes frequently monitored to examine glycolytic, respiratory and metastatic capacity were microanalyzed successfully: lactic dehydrogenase, phosphoglucose isomerase, malate dehydrogenase, acid phosphatase, alkaline phosphatase, aldolase, glucose-6-phosphate dehydrogenase, pyruvate kinase, glycerophosphate dehydrogenase, hexokinase and phosphofructokinase. The majority of the enzymes examined exhibited higher activities in the malignant tumors. Extracts of tumor cells mixed in varying proportions with brain or muscle extracts of rat evidenced no modification of expected activity. The technical adaptation employed provided a sensitive methodology to resolve problems of replication, profile analysis, sample quantity and selectivity within heterogeneous tissues.

(57)

Evidence of Cellulose and Chitin Digestion by Brook, Brown and Rainbow Trout

TOM M. ABBOTT AND ARTHUR E. LINKINS
Virginia Polytechnic Institute and State University

Cellulose, the structural component of plants, and chitin, the major skeletal component of invertebrates, were shown to be processed within the gastro-intestinal tract of brook (*Salvelinus fontinalis*), brown (*Salmo trutta*) and rainbow trout (*S. gairdneri*) collected from Appalachian mountain streams in Virginia. Trout are known to retain chitin, from invertebrate prey, in the stomach after the body tissue has been processed. We hypothesized that chitin retention allows the fish to maximize energy available from the invertebrate diet. Previously, cellulase and chitinase activity were unreported for salmonids. The source of these enzymes appeared to be primarily intestinal microflora. Analyses showed activity was usually higher in the stomach than in the intestine. Breakdown products of cellulose and chitin, D-Glucose and N-Acetyl-D-Glucosamine, respectively, may be available energy sources for trout.

(58)

Plasma Adrenal Steroid Hormone Levels in Channel Catfish Under Experimental Conditions

KENNETH B. DAVIS AND NICK C. PARKER
U.S. Fish and Wildlife Service

A competitive protein-binding radioassay for plasma adrenal steroid hormone concentration was used to study diel levels, response to handling stress and effect of incorporating cortisol in the diet of channel catfish, *Ictalurus punctatus*. Experiments were conducted in 112 l flow-through tanks with 21 C well water. The photoperiod was 12-12 with a 15 minute dawn and dusk. Fish between 80 and 200 g were bled by puncture of the caudal vessels. No sampling effect was apparent if fish were rapidly anesthetized with a 0.02% solution of MS-222®. Steroid levels of fish under resting conditions were low (less than 1 µg %). There was no evidence of

a distinct diel change or difference between sexes when fish were sampled every 6 h for 24 h. At each sample time, six fish were stressed by holding in a net in the tank for 30 minutes. Stressed fish had significantly ($P < 0.05$) elevated cortisol levels ($\bar{x} \pm SE$) which ranged from 3.1 ± 0.53 to 5.7 ± 0.64 µg %; the magnitude of the stress response was similar at all times of the day.

Feeding a purified diet containing cortisol (10 mg/kg) at 3% of the body weight per day for 11 days resulted in a significant ($P < 0.05$) elevation of plasma cortisol (4.32 ± 0.66 µg %) above control values 8 h after feeding. This concentration was comparable to levels found in fish stressed in a net for 30 minutes. Oral administration of cortisol appears to be a promising method of cortisol delivery which would avoid the additional stress of handling and injecting.

(59)

Appearance of the Tumor-Specific Aldehyde Dehydrogenase Phenotype During 2-Acetylaminofluorene-Induced Hepatocarcinogenesis in Rats

BIBB ALLEN AND RONALD LINDAHL
University of Alabama

Elucidation of the molecular mechanisms underlying the phenotypic rearrangements seen in cells transformed by chemical carcinogens provide insights into the regulation of both transformed and normal cell function. We have been investigating the aldehyde dehydrogenase (aldehyde:NAD(P) oxidoreductase, E. C. 1.2.1.3 and 1.2.1.5; AIDH) enzyme system which undergoes a characteristic phenotype rearrangement during chemically-induced hepatocarcinogenesis in rats. Here we report the results of a study of the time course of the appearance of the hepatoma-specific AIDH isozyme phenotype following exposure of male rats to 2-acetylaminofluorene. As of Day 140, the tumor-specific AIDH phenotype has not been expressed nor have any of the animals developed overt tumors. This observation suggests that, although carcinogen exposure causes other demonstrable early changes in liver metabolism, these changes do not involve an early reorganization of the AIDH phenotype. Thus, it appears that the tumor-specific AIDH phenotype is expressed concomitant with the appearance of histologically identifiable tumors suggesting that the expression of the tumor-specific AIDH phenotype is correlated with the development of overt tumors.

(60)

A Reevaluation of the Relationship Between Temperature and the Critical Oxygen Tension of Freshwater Fishes

M. E. GILLESPIE, N. HEISLER AND G. R. ULISCH
University of Alabama and Max Planck Institute for Experimental Medicine

Much of the past work on temperature effects of fish metabolic rate has used actively swimming fish. The data obtained from such studies has often been extrapolated to the standard metabolic rate (SMR), and conclusions concerning temperature effects on SMR have rarely come from directly measured SMR's. One im-

portant conclusion of past work is that the critical oxygen tension (P_c), below which the fish can no longer obtain enough oxygen to sustain the SMR, increases with increasing temperature. We monitored oxygen consumption constantly as a function of P_{O_2} and were able to accurately measure SMR. The SMR of carp was determined at 5, 10, 15 and 25 C; rainbow trout were tested at 10, 15 and 20 C. P_c was constant from 10 to 25 C in carp and from 10 to 15 C in trout; at higher temperatures the changes in P_c for both species were small.

(61)

Altered Tryptophan Oxygenase and Tyrosine Amino Transferase Activity in the Osborne-Mendel "Fatty" Rat

L. B. WEEKLEY, MICHAEL JONES AND T. D. KIMBROUGH
Virginia Commonwealth University

Tryptophan and tyrosine metabolism have been studied from the standpoint of their playing a major role in the development of obesity. Oxidation of tryptophan and tyrosine by hepatic tryptophan oxygenase (TO) and tyrosine amino transferase (TAT) are quantitatively the major oxidative pathways. Osborne-Mendel rats which are predisposed to develop obesity on a high fat diet were compared with Sprague-Dawley rats. In this study both strains of rats were assayed for hepatic TO and TAT activity. The results suggest alterations in these rate-limiting enzymes which may play a role in the development of obesity in the Osborne-Mendel rat.

(62)

Cytological Studies on Some Species and Hybrids of *Habranthus*

W. S. FLORY AND G. L. SMITH
Wake Forest University

Habranthus martinezii, like *H. robustus*, has 12 somatic chromosomes. The complements of the two species are similar. The differences between the two complements will be pointed out. Previous reports have described the F_1 hybrid of *H. robustus* with *H. brachyandrus* ($2n=24$). Hybrids have now been secured of *H. robustus* $\times$ *H. martinezii* and of *H. brachyandrus* $\times$ *H. martinezii*; the analysis of the chromosomes of these hybrids will be described. In addition, a new and as yet undescribed yellow-flowered species of *Habranthus* from Mexico has been studied cytologically. This species has 90 somatic chromosomes with much more variation in length and types being encountered among these than among species of the genus with lower chromosome numbers.

(63)

Methods for Permanently Mounting Ovules Cleared in $4\frac{1}{2}$ -Type Clearing Fluids

J. M. HERR, JR.
University of South Carolina

Ovules cleared in Benzyl Benzoate- $4\frac{1}{2}$ clearing fluid can be permanently mounted in piccolyte or permount

by replacing the clearing fluid with absolute ethanol and upgrading the ovules in mixtures of ethanol and xylene (3:1, 2:2, 1:3, and xylene). The ovules are mounted on a Raj slide in either mountant and covered. Optical sagittal sections through the ovules have a marked similarity to microtome sections. The protoplasts are shrunken sufficiently to distort the outlines of the cell walls. This image so characteristic of permanent preparations has become an acceptable artifact variably assessed as to cause. Another method for permanently mounting cleared ovules leaves the cleared image unaltered and indicates xylene as the actual cause of the artifact. The mountant used contains the ingredients of Spurr low-viscosity embedding medium. Vinylcyclohexene dioxide (10 drops) is combined with diglycidyl ether of polypropyleneglycol (6 drops) and nonenyl succinic anhydride (26 drops). BB- $4\frac{1}{2}$ is mixed with part of this epoxy medium in a graded series of 3:1, 2:2 and 1:3. Ovules treated for 24 hrs in BB- $4\frac{1}{2}$ are passed through this series with 15 minutes exposure to each mixture. The 1:3 mixture is replaced with 20 drops of pure epoxy medium for 15 minutes. One drop of dimethylaminoethanol, the cure accelerator, is then added, and the ovules are mounted and covered immediately on a Raj slide. The preparation is cured in an oven at 60 C for 24 hrs and observed with phase contrast or Nomarski interference optics.

(64)

Comparative Ultrastructure of Three Species of *Trachelomonas* (Euglenophyceae)

LINDA S. DONNELLY AND PATRICIA L. WALNE
University of Tennessee

The euglenoid flagellate, *Trachelomonas*, is distinguished from other members of the Euglenaceae by the presence of a lorica, a mucilaginous cell envelope which may or may not be mineralized. Classical taxonomy of the group has been based on lorica structure which has been shown by more recent research to be quite capricious and dependent upon the environment. Data from analytical light microscopy, SEM and TEM will be presented for representative species from three of Pringsheim's subgeneric categories which are based largely on cytoplasmic features, especially pyrenoid structure: *Trachelomonas bulla* with no pyrenoids, *T. lefevrei* described as having inner pyrenoids and *T. zorensis* with double-sheathed pyrenoids. Observations with both light and electron microscopy have shown that internal organelle structure does not differ significantly among the subgenera. Comparative lorica ultrastructure and elemental analyses of cell-free lorica preparations with SEM-EDX will be presented.

(65)

Niche Width and Genetic Variation in Treefrogs (Anura:Hylidae) of the Piedmont and Coastal Plain in South Carolina

WILLIAM J. ETGES AND MICHAEL H. SMITH
University of Georgia and Savannah River Ecology Laboratory

Adult male treefrogs were collected over a two year period at breeding sites comprising many diverse habitats. Niche width is defined as a multivariate variance

estimate based on 45 niche attributes for the ten species. The species may be separated in this niche space using discriminant functions also based on these 45 field measurements. Starch gel electrophoresis was utilized to show allozyme variation at 25 enzymatic and non-enzymatic structural gene loci. The hypothesis that there is a correlation between niche width and mean genetic heterozygosity for all the species is tested. Evolutionary relationships between sympatric congeneric species is discussed in this ecological genetic context.

(66)

Reproductive Biology of Poeciliid Fishes from Northeastern Mexico

PAUL J. MONACO AND ELLEN M. RASCH
East Tennessee State University

JOSEPH BALSANO
University of Wisconsin, Parkside

Diploid and triploid varieties of the Amazon molly, *Poecilia formosa*, are sympatric with *P. mexicana*, a bisexual species. These three forms constitute a unisexual-bisexual breeding complex in northeastern Mexico. The unisexuals must compete with females of *P. mexicana* for sperm since the former depend on males of this species to maintain their purported gynogenetic mode of reproduction. Although these fish remain reproductively active throughout the year, comparative studies to assess reproductive competence of females, based on cytological characteristics of oogenesis have indicated: (1) that all three forms show cyclic patterns of oocyte development and (2) that in any given season unisexual females will show levels of reproductive potential different from those of their bisexual counterparts. Studies on males of *P. mexicana* reveal that levels of sperm production remain constant throughout the year. Supported in part by grants from NSF (DEB 78-07753 and DEB 77-03257), National Geographic Society and Veterans Administration 1A(74) 111-430100.

(67)

Localization of Aldehyde Dehydrogenase in Rat Liver Cells

P. D. MILLER, H. E. SMITH AND RONALD LINDAHL
University of Alabama

Aldehyde dehydrogenase (aldehyde:NAD oxidoreductase, E.C. 1213) has been localized in organelles resembling peroxisomes or microperoxisomes in the normal rat liver cell. Cytochemical localization has been achieved by brief fixation of small sections of tissue (1mm x 2mm) in 5% paraformaldehyde followed by incubation in a phosphate buffered isotonic solution of propionaldehyde or glutaraldehyde, NAD and thiocarbonyl-nitroblue tetrazolium salt for 60 min. The tissue was then fixed for 50 min in concentrated osmium tetroxide vapors and processed for electron microscopy. Controls omitting the aldehyde substrate and/or NAD from the incubation medium do not show the characteristic staining indicating that this enzyme is aldehyde specific and NAD dependent.

(68)

Demonstration of Uric Acid for Electron Microscopy

CHESTER H. LAKE AND IOLA T. McCLURKIN
University of Mississippi

Silver salts in the presence of uric acid form a dark precipitate, a reaction used in light microscopy to locate uric acid in tissue. This paper reports an adaptation of the procedure to electron microscopy. Since birds excrete much uric acid, the adaptation was developed using avian kidneys. Excised kidney tissue was placed in Millonig's fixative, dehydrated with ethanol and embedded in Epon 812. Thin sections were cut on an ultramicrotome, mounted on nickel grids and stained with uranyl acetate and lead citrate. Control sections received no additional treatment. Test sections were next stained with 20% silver nitrate, exposed to sunlight for 2 hrs to reduce the silver, treated with hydroquinone and washed in 4% NH₄OH. Under the electron microscope, test sections were observed to have the characteristic dark staining membranes found in the controls, plus additional sites of dark staining associated with uric acid.

(69)

Cellular Development in *Coelopa frigida* (Diptera): A Study Using Liquid Scintillation Techniques

R. S. OSTROWSKI AND R. W. WILSON
University of North Carolina, Charlotte

Coelopa frigida is an excellent laboratory organism for studying synchronous cellular development. This dipterous fly goes through complete metamorphosis, i.e., a female lays a clutch of 80 eggs which hatch into larvae, followed by a pupal state and finally emerging as adults twelve days later. These adults emerge within the same two-hour period, i.e., they develop at the organism level in synchrony. With the aid of ³H-thymidine and liquid scintillation techniques and using larvae salivary gland cells as a model, we are endeavoring to demonstrate whether or not this developmental synchrony also exists at the cellular level within each fly.

(70)

Virus Infection of *Trifolium* (Leguminosae) in Suspension Culture

R. A. JONES, E. A. RUPERT AND O. W. BARNETT
South Carolina Agricultural Experiment Station and Clemson University

Longevity of perennial white clover stands is greatly influenced by their resistance to four major viral pathogens. A standardized procedure which allows screening of cultivars through *in vitro* culture and inoculation would be of considerable value. Cell suspensions made from callus tissue cultures of *Trifolium repens*, *T. ambiguum* and *T. hybridum* were inoculated with clover yellow mosaic virus (CYMV). Samples were examined at various time intervals for the presence of viral inclusion bodies and tested by latex serology procedures. Increase in the number of observed inclusion bodies and

in antigen titer are probable evidence of viral multiplication in cultured cells.

(71)

On the Effects of 2,4-D and Picloram on Ploidy Levels of White Clover Callus Culture

JOANNE I. MCCARTHY AND EARLENE A. RUPERT
South Carolina Agricultural Experiment Station and
Clemson University

Many researchers have noted that plant callus cultures tend to undergo changes in ploidy levels with time, and it has been suggested that this may interfere with regeneration of plantlets. Growth regulators added to the medium may contribute to the alteration of the amount of nuclear material. In this study the effects of two auxins, 2,4-dichlorophenoxyacetic acid (2,4-D) and 4-amino-3,5,6-trichloropicolinic acid (Picloram), on nuclear size were investigated. Nuclei from tissue maintained on Murashige-Skoog medium supplemented with 1 mg/l 6(γ , γ -dimethylallyl-amino)-purine (2ip) and either 1 mg/l 2,4-D or 1 mg/l Picloram were measured after subculturing for 3, 4, 5, 6 and 7 months. Ninety-five percent confidence intervals on the means and variances of the nuclear sizes were used to detect differences in cell populations.

(72)

Characterization of Lambda Lysogens Carrying DNA Segments (ilv) from *Escherichia coli* K-12

KENT E. JONES AND ARTHUR L. WILLIAMS
Murray State University

It has been shown that altered DNA segments (ilv⁻) from the isoleucinevaline (ilv) cluster of *E. coli* can be transduced to ilv⁺, via lambda phage. In this study, a lysate prepared on strain KS505 (λ CI857 inserted into ilvC) was shown to transduce the specific DNA segments containing defective ilvA, ilvC and cya genes of the ilv cluster. Also, the results from the enzyme analyses indicated that normal gene activities were restored for each of these recipient strains. The gene dosage effect, determined via specific enzyme assays, indicated a doubling effect for certain genes in different strains and only single expression in others. Furthermore, the use of these lambda derivatives as a genetic tool and a specific source for ilv DNA in studying regulation of the ilv cluster will be discussed.

(73)

Two Species of "*Noturus elegans*" (Ictaluridae) from the Duck River System, Tennessee

DAVID A. ETNIER AND WAYNE C. STARNES
University of Tennessee

Recent fish collections from the main channel Duck River, Tennessee, have produced four madtom specimens currently referable to *Noturus elegans* but quite unlike the strikingly marked specimens of *N. elegans* known from Duck and Buffalo River tributaries. The proper species allocation of the two Duck River forms is considered, as is the status of other populations of *N. ele-*

gans remote from typical populations in the Barren and Green River Systems of Kentucky and Tennessee.

(74)

A New Species of *Fundulus* (Cyprinodontidae) from Central Tennessee

JAMES D. WILLIAMS
U.S. Fish and Wildlife Service

DAVID A. ETNIER
University of Tennessee

A new species of *Fundulus* is described from the headwaters of the Duck and Caney Fork Rivers in Coffee County, Tennessee. It is compared to several species of *Fundulus* in the southern Appalachians to which it is most closely related. The ecology of the new species is briefly discussed. The conservation status of the new species and four other southeastern species of *Fundulus* is reviewed.

(75)

Population Dynamics of Reef Fishes on a Nearshore Rock Scarp in Onslow Bay, North Carolina

D. G. LINDQUIST AND TONY HARRIS
University of North Carolina, Wilmington and
East Carolina University

Strip transects, over a low relief rock scarp, were run twice monthly by SCUBA divers in July-September, 1977, and June-November, 1978, to assess the relative abundance of non-cryptic diurnal reef fishes. Four species, *Centropristis striata*, *Stenotomus aculeatus*, *Haemulon aurolineatum* and *Pareques umbrosus*, accounted for over 90% of the abundance by density. *Monacanthus hispidus*, *Tautoga onitis*, *Mycteroperca microlepis*, *Calamus leucosteus* and *Haemulon plumieri*, although consistently observed, did not contribute greatly to abundance. The abundance of *C. striata* showed little variation over time while *S. aculeatus* was more sporadic. The populations of *P. umbrosus* and *H. aurolineatum* both showed trends indicating increasing abundance over time. These results are discussed in terms of the diurnal habits (home range and mobility) of the species. *Centropristis striata* has limited mobility and a limited home range, while *S. aculeatus* is highly mobile with a larger home range. *Pareques umbrosus* is an aggregating species with highly restricted movements while *H. aurolineatum* is a wide ranging schooling species.

(76)

Comparative Ecology of Two Species of Co-Inhabiting Tide Pool Blennies

G. T. CHANDLER AND D. G. LINDQUIST
University of North Carolina, Wilmington

The crested blenny, *Hypleurochilus geminatus*, and the feathered blenny, *Hypsoblennius hentzi*, are co-inhabitants of rocky tide pools in southeastern North Carolina. The presence of the two species suggests a study

of ecological competition for this limited intertidal reef habitat. Blennies were collected from rocky tide pools during seven monthly samples in 1976. Specimens were anesthetized and transported to laboratory aquaria or fixed immediately in formalin. Habitat utilization and agonistic behavior were investigated in the laboratory. Reproduction, diet and size classes were determined for preserved specimens. Individuals were also tagged and displaced at varying distances from capture pools in order to determine homing ability.

(77)

Reproductive Behavior of the Bluestripe Shiner, *Notropis callitaenia*, in Uchee Creek, Alabama

RICHARD K. WALLACE, JR.
Auburn University

Notropis callitaenia appeared to have mature eggs in April, 1978 (21 C); spawning was first noted in late June (25 C). Mature fish had moved from deeper pools to swift, shallow bedrock runs. Males attracted females by erecting dorsal, anal and ventral fins in moderate current on the upstream side of a large flat rock in about 30 cm of water. When this failed, males entered the adjacent swift current and chased one or more females to a crevice beneath the rock. The male swam on its side over the crevice several times until followed by a female on its side. Spawning occurred after several passes when the female, now in the lead, appeared to vibrate against the crevice followed by the male. Spawning continued for several hours involving two or three males and an unknown number of females. The underside of the rock had hundreds of adhesive eggs in various stages of development in three or four layers. Ripe females were present the previous year until early August (25 C).

(78)

Description of a New Subgenus of *Etheostoma* (Percidae)

JAMES D. WILLIAMS
U.S. Fish and Wildlife Service

HENRY W. ROBINSON
Southern Arkansas University

The new subgenus is diagnosed and briefly described. It consists of five species, *Etheostoma punctulatum*, *E. cragini*, *E. pallidiorum*, *E. boschungii* and *E. trisella*. These species are distributed from the Arkansas River drainage in Colorado to the upper Coosa River drainage in north Georgia and southeast Tennessee. Distribution, dispersal and relationships of the five species in the subgenus are discussed.

(79)

Notes on the Spawning, Fecundity and Diet of the Waccamaw Killifish, *Fundulus waccamensis*

P. W. SHUTE, J. R. SHUTE AND D. G. LINDQUIST
University of North Carolina, Wilmington

A spawning aggregation of Waccamaw Killifish, *Fundulus waccamensis*, was observed along the vegetated

southwestern shore of Lake Waccamaw, North Carolina, on 29 July, 1978. Water depth was between 0.25 and 0.5 m. Water temperature was 35 C. Littoral vegetation was hatpin, *Eriocaulon*, and maidencane, *Panicum*. Turbidity was low and sexual dichromatism marked, enabling easy observation. Solitary males exhibited metallic blue bars and defended territories approximately 0.5 m². Females schooled in groups of 3 to 6. Spawning occurred as stray females were cornered in the male's territory. Eggs were deposited on the silty substrate, possibly on vegetation. Collections made at this time revealed gravid females. The ovaries of females collected on 15 April, 1977, revealed up to 675 eggs with a mean of 377 and three size classes of ova. Although their mouth appears adapted for surface feeding, gut contents from different areas and dates show that *F. waccamensis* is primarily a benthic feeder.

(80)

Reproductive Cycles and Maturity Determinations in Carcharhinid Sharks of the Northern Gulf of Mexico

STEVEN BRANSTETTER
University of South Alabama and
Dauphin Island Sea Lab

Between April and December, 1978, more than 250 sharks of 15 species were collected. Of these, 69 were tagged and released with sex and total lengths recorded. The remainder were examined closely for reproductive development. Collections using rod and reel and floating longlines supplied a major portion of the specimens, while fishing tournaments along the northwest Florida, Alabama and Mississippi coast allowed examination of larger species. Four species appeared regularly throughout the study period. In order of abundance these were: *Carcharhinus limbatus* (74), *Rhizoprionodon terraenovae* (45), *Carcharhinus maculipinnis* (23) and *Carcharhinus milberti* (13). Collection of these species allowed determination of size ranges, length at maturation, gestation periods and birthing and mating periods. In addition, some morphological characters used to distinguish *C. maculipinnis* from *C. limbatus* were found to be inadequate. More consistent characters have been selected for identifications.

(81)

An Isozymic Comparison of Two Distinct Chromosomal Races of *Fundulus notatus* (Cyprinodontidae)

F. M. TATUM, HERBERT BOSCHUNG AND
RONALD LINDAHL
University of Alabama

A distinctive chromosomal race of *Fundulus notatus* occurs in the Upper Tombigbee River System of Alabama and Mississippi. The race possesses 2N=44 chromosomes while all other populations of *F. notatus* characteristically possess 2N=40 chromosomes. Since the two races are morphologically indistinguishable, it is of interest to know whether biochemical changes have accompanied this change in karyotype. To date, 14 enzymes coded by 25 loci have been compared by means of starch-gel electrophoresis. Twelve of the enzymes

have consistently exhibited identical electrophoretic patterns and mobilities. Intra-race and inter-race allelic variants have been detected in the enzyme systems of phosphoglucosmutase and glucoseseophosphate isomeras. The data suggest the two chromosomal races of *F. notatus* reflect a high degree of homogeneity with respect to their enzyme systems.

(82)

Distribution and Ecology of the Fishes of Lake Pontchartrain and Nearby Marshes

B. THOMPSON, S. LEVINE, S. VERRET AND
M. FANNALY

Louisiana State University

Lake Pontchartrain is a large (1,632 sq km), shallow, relatively restricted estuary in SE Louisiana. Monthly collections at 17 stations were made during 1978 using a variety of sampling gear. Physical and chemical parameters were included at each station. Four marsh sites were sampled to evaluate the interplay between the lake proper and the marsh area. Sixty-five species of fishes were collected in Lake Pontchartrain and 49 species in the surrounding marsh. Twenty-three species were found only or nearly only in the lake while 17 species were considered primary marsh inhabitants. One of the most important ecological factors in Lake Pontchartrain is the presence of large grass beds along much of the northern shore of the lake. Fifteen species were taken exclusively or nearly so in these beds. The lake undergoes a drastic late fall/early winter emigration and is repopulated during the next late winter and spring. The five most abundant fish during 1978 were: *Anchoa mitchilli*, *Brevoortia patronus*, *Micropogonias undulatus*, *Menidia beryllina* and *Leiostomus xanthurus*. New or rare records include: *Acipenser oxyrhynchus*, *Polyodon spathula*, *Carpiodes carpio*, *Fundulus jenkinsi*, *Astroscopus y-graecum*, *Gobionellus boleosoma* and *Monaecanthus hispidus*.

(83)

Some Observations on the Pituitaries of Intersexual *Gambusia affinis* (Poeciliidae)

CHRISTOPHER WIERNICKI AND DALE T. DRYSDALE

University of West Florida

A naturally occurring intersexual population of *Gambusia affinis* was examined for pituitary anomalies using histology and histochemical techniques. In the region of the proximal pars distalis and extending into the rostral pars distalis, the pituitaries of the intersexual females show a proliferation both ventrally and laterally of gonadotrophic cells when compared to both normal males and females. Morphologically the abnormal pituitaries appear to be wider and the ventral surface is discernibly less convex. It has been postulated that a chemical which mimics a releasing factor and stimulates increased growth of the gonadotrophic cells may be entering the water column.

(84)

Validation of Methods Used in the Age Determination of Red Snapper, *Lutjanus campechanus*

CHARLES L. HOLLINGSWORTH AND STEPHEN A. BORTONE
University of West Florida

Several methods were employed to determine the age and growth of red snapper from the northern Gulf of Mexico. These methods include aging by scales, otoliths, vertebrae, opercula and dorsal spines. Comparisons of the age results were made with length frequency data. Scales are the easiest to prepare but are the least reliable in terms of growth check formation and variability. Ossified tissues have a much lower variation but are difficult to prepare. Otoliths offer the best alternative as they are relatively easy to prepare, and they produce discernible growth checks with a minimum of variation. Age and growth parameters of red snapper from the northern Gulf of Mexico differ from red snapper from other parts of its range.

(85)

Studies on an Accessory Reproduction Structure in a Synchronous Hermaphrodite

LESLIE W. TOUART

University of West Florida

The structure of the gonad in the synchronous hermaphrodite, *Diplectrum bivittatum* (Serranidae), collected from the Gulf of Mexico was studied. The general morphology agrees with previously reported accounts of the gonad in the genus *Diplectrum*. Gonadal changes are associated with varying season. An accessory gland is found in the posterior section of the gonad. The gland bifurcates posteriorly and is differentiated by a thinner wall than the gonad proper. Ovarian and testicular tissue are distinctly separated from the gland. The gland consists of columnar epithelial cells forming a villae-like structure. The gland is secretory in nature and functions in gonadal regulation or as a pheromone producer. The gland is important in understanding the systematic and evolutionary relationships in the genus *Diplectrum* and the family Serranidae.

(86)

Taxometric Comparison of Feeding Strategies in Lutjanid Fishes

D. M. SIEGEL, S. A. BORTONE AND J. L. OGLESBY

University of West Florida

Taxometric analyses were used to investigate possible similarities and correlations among feeding strategies of *Lutjanus campechanus*, *L. synagris* and *Rhomboplites aurorubens* from coastal areas of the Gulf of Mexico and the Western Atlantic Ocean. Stomach content data from published and unpublished reports were compared using correlation coefficients and UPGMA clustering of percent occurrence and percent volume food item data. Jaccard's coefficient for the presence/absence of food items was also used to compare feeding strategies. Each OTU represented a species collected at a specific loca-

tion, time and substrate type with several capture methods. Results of the cluster analysis based on correlation of OTUs by percent occurrence data indicated a feeding relationship due to location, time of feeding and species respectively. Percent volume correlations indicated OTU's were related by size. Numerical taxometric methods are an effective way of comparing multi-source food studies.

(87)

Gonad Morphology of *Pikea mexicana* (Serranidae)

T. FEENEY, E. DONAHUE AND S. A. BORTONE
University of West Florida

Forty-six specimens of *Pikea mexicana* were collected from the Gulf of Mexico from several months throughout the year. The gonads were examined histologically to study the reproductive biology and structure of this species. Spawning takes place from late spring to October with most females producing mature eggs in June, July and August. All fish can be sexed at a small size. The size range for females in the present study were 47-123 mmSL and for males 57-138 mmSL. The extended overlap in size range between males and females as well as the presence of a lumen in the testis of males along with several other characteristics suggests that *Pikea mexicana* is a secondary gonochorist. This study suggests that the genus *Liopropoma*, which also displays secondary gonochorism, may be synonymous with *Pikea*.

(88)

A Hermaphroditic Largemouth Bass, *Micropterus salmoides* (Centrarchidae)

JOHN S. PENN AND RODNEY PARRISH
University of West Florida and Bionomics, Inc.

A 1.5 kg largemouth bass was obtained from the Suwanee River near Branford, Florida in April, 1977. The specimen, upon dissection, appeared to have abnormal gonads, being typically bi-lobed, but one of the lobes had proliferated into a bulbous, sac-like structure. The tissue had been stored in ten percent formalin for eighteen months. A histological study was done using Mayer's hematoxylin and eosin, and the fish was determined to contain both male and female gonadal tissue, marking the second report of hermaphroditism in this family. Near-mature eggs were recognized in the bulbous tissue and the remaining tissue, testicular in nature, was full of spermatozoa. Ducts were found to contain both male and female gametes. Thus, the fish was possibly capable of self-fertilization.

(89)

Acute Toxicity of Characteristic Acid Strip Mine Wastes to Aquatic Macroinvertebrates: Selected Heavy Metals and H⁺ Concentration

LOU MARTINO, E. L. MORGAN AND JAMES ORR
Tennessee Technological University

The proposed acceleration of coal production in the U.S. required that the biological effects of acid-mine

wastes become better understood. The acute toxicity of acid strip mine wastes typical of Cumberland Plateau areas was evaluated using representative taxa of the orders Gastropoda, Ephemeroptera and Amphipoda. Static 24 and 56 hr continuous flow bioassays were carried out in the lab in the fall of 1978. Modified Mount-Brungs proportional diluters and Freeman constant flow delivery devices were used to administer an array of manganese and aluminum salts and H⁺ levels at 20 C in moderately hard-alkaline water. Ten organisms per concentration in replicate were held in amber vials closed at either end with nylon mesh and immersed in 3.8 l test tanks with bottom entrance and surface exit of test water. All test tanks were continuously aerated. Mortalities were recorded and results obtained by log probit analysis to establish 96 hr LC50 values. Values obtained will be discussed in light of potential impacts resulting from coal production.

(90)

Methemoglobin Formation in Channel Catfish Intensively Cultured in Aerated Ponds

N. C. PARKER, K. B. DAVIS AND J. R. TOMASSO
U.S. Fish and Wildlife Service and
Memphis State University

Elevated nitrite concentrations are often associated with metabolic wastes and are known to cause oxidation of hemoglobin to methemoglobin, a form incapable of transporting oxygen. Channel catfish (*Ictalurus punctatus*) blood was analyzed for hemoglobin (Hb) and methemoglobin (MHb) concentrations to detect physiological impairment of intensively cultured fish. Catfish were stocked in duplicate ponds at 100, 200, 400 and 800 fish/0.02 ha. Eight ponds were equipped with continuously operated air-lift pumps to aerate and circulate the water. Two control ponds without air-lift pumps were stocked with 100 fish each.

Densities ranged from 2,236 to 13,328 kg/ha 142 days after stocking when the two ponds with 800 fish were partially harvested by removing 400 fish. Percent MHb ($\bar{x} \pm SD$) ranged from 0.3 ± 0.5 to $19.4 \pm 7.8\%$ and was positively correlated ($P < 0.05$) with NO₂-N ($r = 0.57$, $d.f. = 45$) and weight of fish per pond ($r = 0.64$, $d.f. = 34$). At final harvest, 204 days after stocking, fish densities ranged from 2,052 to 11,738 kg/ha and percent MHb was generally lower ranging from 1.8 ± 2.1 to $12.8 \pm 7.8\%$. MHb was positively correlated with weight of fish per pond ($r = 0.30$, $d.f. = 44$, $P < 0.05$) but not with NO₂-N. There was no significant difference in blood Hb concentration among any of the groups, indicating that fish did not compensate for elevated MHb levels by increasing hematopoiesis. Individuals with MHb as high as 33.9% survived the stressful processes of handling, bleeding and measuring associated with data collection.

(91)

Effects of Inflowing Sediments on Plankton Production

C. M. COOPER AND K. W. ROUSH
USDA Sedimentation Laboratory, Oxford, MS

Monthly chlorophyll values from Lake Chicot, Arkansas, during solar years 1977 and 1978, showed plankton

production to be limited by inflowing sediments. Lake Chicot, a 21.4 km² oxbow of the Mississippi River, is separated into two bodies by a dike, and the upper lake is normally a closed system with little inflow whereas the lower lake has a drainage of 932 km² and a water residence time of 0.39 years. Chlorophyll *a* values in the lower lake peaked at 0.16 and 0.18 mg/l in October, 1977, and September, 1978, while values in the upper lake reached 0.22 and 0.24 mg/l during the same months. Values declined each winter and spring when total solids, which were primarily inflowing inorganic sediments, increased above 150 ppm. Total solids averaged 550 ppm in May in the lower lake and did not decline below 150 ppm until July at which time chlorophyll production began to increase. The isolated upper lake seldom had a total solid content of over 125 ppm and was productive throughout each year. A correlation between chlorophyll and total solids showed an inverse relation with an *r* value of -0.49 which was significant at the 0.05 level.

(92)

Limnological Events in a Temporary Pond

RICHARD F. MODLIN

University of Alabama, Huntsville

Parameters in a 0.2 ha forested pond were measured weekly. The pond, located in northern Alabama, existed from December to June. Four species each of Cladocera and Copepoda were the dominant animal component. The major primary producer, the attached alga *Draparnaldia glomerata*, bloomed during February. Water temperature never dropped below 4 C, although the pond surface did become ice-covered for two weeks. Water pH averaged 6.0. Oscillations in the concentrations of NH₃, NO₂⁻, NO₃⁻ and soluble PO₄⁻³ closely followed the changes in biological events. The surface to volume ratio of the pond changed in one week during April from 4.2 to 6.7. This rapid reduction in pond size was attributed to increased rates of evapo-transpiration. Conditions that once indicated an apparent thriving community quickly switched, after the pond contracted, to a state of degradation.

(93)

The Sublethal Effects of Selenium on the Biology of *Daphnia pulex* (Cladocera)

JEFFREY T. READING AND ARTHUR L. BUIKEMA, JR.

Virginia Polytechnic Institute and State University

The sublethal effects of selenium, at 0.2, 0.4, 0.6 and 0.8 mg/l selenium as selenite, on *Daphnia pulex* were monitored for twenty-eight days, starting with animals 24 ± 12 hrs old. The *Daphnia* were held one to a container at 20 C. Each day the animals were monitored, fed and the test solutions were changed. The results were analyzed statistically by brood. Growth, measured by length, was gradually not affected except during the pre-reproductive instars where length was depressed at the highest concentration. Reproduction definitely was affected; generally during the early broods, the number of live young, deteriorated eggs and partial and full abortions were significantly affected at the two highest concentrations. These differences did not occur in later broods, and it appeared that the *Daphnia* were acclimating to the selenium stress.

(94)

Temperature Preference of Three Important Freshwater Fish Species in the Middle Atlantic Region

E. L. MELISKY, J. R. STAUFFER, JR. AND C. H. HOCUTT

*Appalachian Environmental Laboratory,
University of Maryland, Frostburg*

A horizontal temperature preference trough was used to determine the acute temperature preference responses for several acclimation temperatures of three freshwater fish species from the Middle Atlantic Region. One- to three-year-old spottail shiners (*Notropis hudsonius*) collected from a southern Pennsylvania tributary of the Susquehanna River had a final temperature preferendum 29.1 C (*r*² = 77.1). One- to three-year-old bluntnose minnows (*Pimephales notatus*) captured from the Monocacy River in Maryland had a final selected temperature of 23.1 C (*r*² = 78.2). Young-of-the-year rainbow trout (*Salmo gairdneri*) obtained from a Maryland state hatchery showed no definable effect of acclimation temperature on preferred temperature. A similar phenomenon has been observed in other salmonid genera.

(95)

A Preliminary Investigation of Selected Female Trout Harvests with the Use of the Leslie Matrix Model

R. L. REISH, K. R. DIXON, C. H. HOCUTT AND
J. R. STAUFFER, JR.

*Appalachian Environmental Laboratory,
University of Maryland, Frostburg*

The worthiness of using selected female harvests as a possible managerial strategy is evaluated using the Leslie Matrix model. Harvesting certain age selected females in a heavily fished trout stream increases the population's intrinsic growth rate and reproductive value 2.47 and 1.45 times, respectively. Such a selected female harvest policy can maintain a higher maximum yield and can shift percentage distribution toward higher and lower age classes. Maximum sustainable yield under this strategy can best be attained by setting the size limits as follows:

1. The lower size limit should be set at an average length of the beginning year-old female age class.
2. The upper size limit should be invoked at the average length of the last viable cohort just after the breeding season.

The sensitivity of the results depends on the severity of fishing pressure.

(96)

Effects of a Gasoline Spill on Macroinvertebrates and Fish

D. K. VANN, D. R. LISPI, C. H. HOCUTT AND
J. R. STAUFFER, JR.

*Appalachian Environmental Laboratory,
University of Maryland, Frostburg*

In September, 1978, a gasoline spill of a reported 6,300 l occurred in Hampton Township, north of Pitts-

burgh, Pennsylvania. The spill flowed into Crouse Run (Allegheny Drainage) and caused temporary evacuation of fifty homes. The effects of gasoline on macroinvertebrates and fish has not been well documented. Stations above and below the spill at nine locations were collected using a seine and a D-frame invertebrate net. Effects on macroinvertebrates and fish are reported.

(97)

Longitudinal Distribution of the Fishes of Raystown Branch, Juniata River, Susquehanna River Drainage

R. D. WILLIAMS, T. Y. BARILA, C. H. HOCUTT AND J. R. STAUFFER, JR.

University of Maryland, Frostburg
Appalachian Environmental Laboratory,

Forty-five fish species were collected at 35 localities from Raystown Branch, Juniata River, during the summer and fall, 1978. A range extension was established for the banded darter, *Etheostoma zonale*. *Rhinichthys atratulus* was the most commonly occurring species in first order streams, *cataractae* in second, *Catostomus commersoni* in third, *Notropis rubellus* in fourth, and *Noturus insignis* and *Lepomis auritus* in fifth. Physical parameters, from first to fifth order, were as follows: mean gradient from 17.4 m/km to 3.9 m/km, mean depth from 4.9 cm to 37.4 cm and mean width from 2.7 m to 42.3 m. Altitude ranged from 82.9 m to 182.8 m. First through fifth order streams contained the following number of species, respectively: 16, 25, 37, 25, 24.

(98)

Temperature Preference of the American Eel, *Anquilla rostrata* (Lesueur), from Maryland

T. Y. BARILA, J. R. STAUFFER, JR. AND C. H. HOCUTT
Appalachian Environmental Laboratory,
University of Maryland, Frostburg

Acute temperature preference tests were conducted with American eels collected from Maryland's Eastern Shore. Eels acclimated to 6, 12, 18 and 24 C selected 20.7, 15.2, 18.6 and 22.2 C, respectively. These data differ from the temperature responses of the majority of fishes tested to date, in that acclimation temperature did not influence selected temperatures. Similar results were obtained for various salmonid species (*Oncorhynchus*, *Salmo* and *Salvelinus*) by other investigators.

(99)

Paper Canceled

(100)

Comparison of Acute Toxicity Between Epigean and Hypogean Isopods (Asellidae) to Zinc, Cadmium and Total Residual Chlorine

ART D. BOSNAK AND ERIC L. MORGAN
Tennessee Technological University

Aquatic toxicology typically deals with the evaluation of pollutants upon epigean organisms; little attention has been given to the fate of these same pollutants in waters which flow through subterranean karst drainages and the impacts placed on hypogean communities. Studies were designed to test the hypothesis that hypogean organisms would be more sensitive to hazardous toxicants than epigean forms. During the late summer and early fall of 1978, *Asellus alabamensis*, a blind hypogean cave isopod, and *Lirycus* sp., an epigean isopod, were collected from similar habitats and tested in the laboratory to establish 96 hr LC50 values for zinc, cadmium and total residual chlorine in flow-through bioassays. Dilution water used in these tests was taken from site-specific locations where organisms were collected. Resulting 96 hr LC50 values and confidence limits for each toxicant were derived by Log Probability Analyses and will be discussed in light of species specific responses. Supported by funds provided by the National Speleological Society Save-The-Caves Fund and Aquatic Ecology Fund, Tennessee Technological University.

(101)

Automated Biosensing from Remote Platforms and NOAA GOES Satellite Data Retrieval for Water Quality Management: Demonstration Project

E. L. MORGAN
Tennessee Technological University

K. W. EAGLESON
North Carolina Department of Natural Resources

N. D. MCCOLLOUGH, JR.
University of Tennessee

R. HERRMAN, R. C. MATHEWS AND R. E. BURGE
National Park Service

This study was designed with the objective of testing remote "biosensing" units in site-specific applications with real-time data retrieval from Convertible Data Collection Platforms (CDCP) and NOAA's GOES Satellite. From Abram's Creek drainage of Cades Cove, Great Smoky National Park, two stations were established, one upstream above most pollutional sources and a second downstream receiving multiple impacts from tourist activities and pasture runoff. Remote monitoring was achieved at each station for two discrete time intervals daily by fish (rainbow trout) biosensors and

Hydrolab multi-parameter measurements. Information obtained was transmitted by NASA CDCP to NOAA's GOES satellite for data reception and processing at a central receiving station. Preliminary results and implications for future water quality management strategies employing remote biosensing will be discussed. *Supported by the Aquatic Ecology Fund, Tennessee Technological University, and private endowments.*

(102)

Abundance and Distribution of Larval Reptant Decapod Crustaceans in Neritic Waters of the Northern Gulf of Mexico, July, 1976

BRYAN L. ANDRYSZAK AND FRANK M. TRUESDALE
Louisiana State University

Oblique hauls of a 61 cm bongo net (0.505 mm mesh) at 33 stations yielded 60 kinds and at least 20 families of macrurans, anomurans and brachyurans. Plankton volumes (fishes removed) ranged from 4.8-88.0 ml with less than 1.0 to 27.0% reptant larvae. *Callinectes* spp. and *Portunus* spp. were the only reptants occurring at all stations and were first and third, respectively, in overall abundance. First and second zoeal stages of *Callinectes* spp. were most abundant at nearshore stations; more advanced stages were predominant offshore. Larvae of the semiterrestrial fiddler crabs, *Uca* spp., were second in overall abundance but occurred at only 24 stations. Third through fifth zoeae and megalopae of *Uca* spp. were abundant and widespread but no first zoeae and very few second zoeae were collected. Our data support a pattern of postlarval recruitment to estuarine areas by *Callinectes* spp. and *Uca* spp.

(103)

Bicarbonate Utilization by *Utricularia* (Lenticulariaceae) and the Influence of pH and Alkalinity on the Distribution of Some South Carolina Species

ELAINE J. DORWARD AND DAVID W. EVANS
*Maryville College and
Savannah River Ecology Laboratory*

Seven species of bladderworts of the genus *Utricularia* were tested for the ability to use bicarbonate ion in addition to free CO₂ in photosynthesis. Only *U. vulgaris* would seem to be able to use bicarbonate ion. Sampling of aquatic habitats in the coastal plain and piedmont of South Carolina showed all species but *U. vulgaris* to favor more acidic, low alkalinity environments where free CO₂ rather than bicarbonate ion was the preponderant form of inorganic carbon available for photosynthesis. This is consistent with the reported distribution of *Utricularia* in North America.

(104)

Testing Aquatic Plants for the Ability to Use Bicarbonate Ion in Photosynthesis

D. W. EVANS, M. F. BABCOCK AND E. J. DORWARD
Savannah River Ecology Laboratory

More than 25 species of aquatic plants were tested for their ability to utilize bicarbonate ion as well as free CO₂ in photosynthesis. The test procedure used the maximum pH attained by inorganic nutrient solutions in which the plants were allowed to photosynthesize in closed containers. Species able to use bicarbonate attained solution pH's greater than 10.5 whereas non-bicarbonate users attained pH's of less than 9.5.

(105)

Bluegill (*Lepomis macrochirus*) Blood Enzymes as Indicators of Exposure to Sublethal Concentrations of Cadmium

DARIO J. DAL SANTO AND JOHN H. RODGERS, JR.
East Tennessee State University

To evaluate potential harmful effects of effluents on aquatic organisms, ecologists have historically conducted bioassays with lethality as an end point (e.g., -96 hr LC₅₀). More recently, approaches have centered around monitoring physiological responses (respiration, electrolytes, hormones, enzymes) since harmful concentrations may be detected earlier and more rapidly than obvious physical responses (death or behavioral changes). Bluegills were exposed to a regime of cadmium concentrations ranging from 30 to 300 µg Cd/l as cadmium chloride in a continuous flow laboratory apparatus. Blood was collected from fish at intervals over a period of two weeks. The separated plasma was assayed for alkaline phosphatase, aspartate aminotransferase (glutamic oxalacetate transaminase), alanine aminotransferase (glutamic pyruvic transaminase) and sorbitol dehydrogenase activity. Changes in enzyme activity were evaluated through time for significance at each of the cadmium concentrations. Results are discussed with consideration of the reported maximum allowable toxicant concentration (MATC) for bluegill of 31-80 mg Cd/l.

(106)

Periphyton Respiratory Electron Transport System as an Indicator of Perturbation in the Watauga River, Tennessee

L. J. DAVID WALLACE AND JOHN H. RODGERS, JR.
East Tennessee State University

The reduction of a tetrazolium chloride salt, 2-p-iodophenyl-3-p-nitrophenyl-5-phenyltetrazolium chloride (INT), by the periphyton community respiratory electron transport system (ETS) was studied on the Watauga River in Tennessee. Sampling sites were located in the vicinity of industrial and municipal effluents. The objectives of the research were to 1) confirm the use of the ETS assay as a reliable estimate of oxygen consumption by epilithophyton and 2) evaluate this procedure as a means to discern perturbation in a lotic ecosystem. The ETS activity of the attached microbial

community from cobblesized stones was compared to concurrent measurements of dissolved oxygen consumption made with chambers incubated *in situ*. Chemical and physical characteristics monitored at each site included temperature, pH, alkalinity, dissolved oxygen, sulfates, phosphorus and nitrogen.

(107)

Periphyton Respiration in the Watauga River, Tennessee: Impact of Industrial and Municipal Effluents

B. KEVIN MOLLOY AND JOHN H. RODGERS, JR.
East Tennessee State University

In conjunction with determinations of physical and chemical characteristics of water quality in the Watauga River, periphyton respiration was measured to evaluate effects of an industrial and a municipal effluent. The research was initiated to determine the usefulness of this approach to detect perturbation in this lotic ecosystem. Abiotic characteristics monitored included temperature, pH, conductivity, turbidity, dissolved oxygen, phosphates, nitrogen, sulfates and chemical oxygen demand. Biotic attributes monitored consisted of both structural (dry weight, ash-free dry weight, chlorophyll *a*, autotrophic index) and functional (epilithophyton respiration and biological oxygen demand) indices. *In situ* measurements of periphyton respiration were facilitated by a polystyrene chamber which incorporated a motor to maintain internal mixing of water during incubation.

(108)

Competitive Ability of a Highly Endemic Cedar Glade Species: *Echinacea tennesseensis* (Compositae)

THOMAS E. HEMMERLY
Middle Tennessee State University

The competitive capacity of the cedar glade endemic, *Echinacea tennesseensis*, was studied by both field and growth chamber experiments. When seeds of the composite were sown into open cedar glade plots, the survival of the resulting seedlings was correlated primarily with the presence of the glade grass, *Sporobolus vaginiflorus*; soil depth was a less important factor. A growth chamber experiment indicated the competitive ability of *E. tennesseensis* to be comparable to that of *E. pallida* and *E. purpurea*, both widespread prairie species. The rapid, early growth of roots of seedlings coincides with spring moisture available in Tennessee cedar glades.

(109)

Reproduction of Native American Chestnut (*Castanea dentata*: Fagaceae) at a Site in the Georgia Piedmont

ROSS C. CLARK
Ersine College

American chestnut trees showing unusual resistance to *Endothia* blight occur on xeric quartzite ridges where Pine Mountain crosses the Flint River. Though the trees

are stump-sprouting, several produce pollen and at least one is producing viable seed. Juvenile individuals produced from viable seed are present in the population.

(110)

Causes of Plant Succession on Old Fields of Lancaster County, Pennsylvania

CATHERINE KEEVER
Millersville State College

The abundance of *Barbarea vulgaris*, R. Br., *Setaria glauca* (L.) Beauv. and *Ambrosia artemisiifolia* L., the most abundant species in fields the first year after abandonment in Lancaster County, Pennsylvania, is strongly influenced by the time of year bare soil is present in relation to the time that seeds of these species are capable of germinating. Certain agricultural practices, including the use of herbicides, tend to segregate these species into different fields. *Aster pilosus* Wild. is the distinct dominant in second-year fields and continues in some importance for 3-4 years. As *A. pilosus* decreases in abundance, there is a great increase of *Lonicera japonica* Thunb., *Rubus* spp., *Rhus typhina* L., *Prunus serotina* Ehrh. and *Solidago nemoralis* A.T. Abandoned fields and pastures are usually occupied by a closed canopy and hardwood species in less than twenty years.

(111)

The Success of Alien Angiosperm Species in Chickamauga Battlefield

GENE S. VAN HORN
University of Tennessee, Chattanooga

Chickamauga Battlefield is an area which has been very disturbed for an extended period. The area was cleared for farming, a major battle was fought there, and it was the site of an Army base for many years. There were two nurseries on the site for several years and many alien plant species were introduced. Native species were also planted. Presently, 10% of the battlefield is mowed where farms were present during the major military encounter of 1863. The observations for this report were made during a four-year period of plant collecting for a checklist of the area. Alien species represent 23.6% of the existing flora. Their success varies greatly with the habitat. The 84 alien species are found in the forest (7%), mowed fields (63%), cedar glades (19%), margins of the foregoing (8%) and streams (3%). The countries of origin for the aliens was determined and most are from Europe. The families and genera with the most alien species were also determined.

(112)

Fire in a *Sarracenia flava* (Sarracenaceae) Community

EDWARD WEISS
University of Georgia

Fire is recognized as an important natural component in many Southeastern plant communities. In the nutrient-deficient, highly acidic conditions of pitcher plant

habitats, fire may function as a means of nutrient regeneration as well as controller of community composition. Field studies were conducted to determine the effects of winter and summer burns on the pitcher plant, *Sarracenia flava* L. Emphasis was placed on the morphological status and nutrient status of this plant through the growing season. Consideration of the role of carnivory in the responses of *S. flava* was also of primary importance.

(113)

The Role of Successional Vegetation in Nutrient Conservation on a Clearcut Appalachian Watershed

LINDSAY R. BORING
University of Georgia

The components of revegetation, to include vegetation nutrient pools, were assessed during first year of recovery following disturbance by cable logging at Coweeta Hydrologic Laboratory. First year nutrient pools were estimated at 29 to 44% of those on an undisturbed adjacent watershed. Among growth forms, hardwood sprouts comprised most NPP and nutrient accumulation with herbaceous vegetation ranking as secondarily important. Sprouting and herbaceous successional species exhibited higher NPP and nutrient accumulation rates than climax species. These pioneer species show great adaptability to conditions following disturbance due to competitive advantages in growth rate, growth form and reproductive capacity. Abundance of these species and the rapid growth of hardwood sprouts are mechanisms of community perturbation response. This minimizes hydrologic losses of elements and ensures a rapid recovery of the forest to predisturbance conditions.

(114)

Some Changes in the Native Biota at Stone Mountain in Two Decades

GAYTHER L. PLUMMER
University of Georgia

Stone Mountain — an outstanding granite, lichen-covered, monadnock, one and one-half miles long, three-fourths of a mile wide and rising 650 feet above its base — is the attractive feature of one of the most celebrated natural-history ecosystems in Georgia. This dome lies directly downwind from an extraordinary amount of metropolitan activities. Lichens in particular on the dome have been impacted severely by combinations of acid rain, trampling by tourists and associated antibiotics. Biotic changes since 1957 indicate that life on the dome shall have very limited potentialities. The environment is likely to become harsher and more difficult for cryptogamic communities.

(115)

The Plant Communities and Flora of Bryant Mill Creek, Brunswick County, North Carolina

JAMES C. MURPHY AND JAMES MCCRIMMON
North Carolina State University

CHARLES B. McDONALD
East Carolina University

Bryant Mill Creek, a small tributary of the Cape Fear River, is located in northern Brunswick County, approximately 20 miles west of Wilmington, North Carolina. Its steep ravine slopes expose Castle Hayne limestone and create conditions that are unusual for that portion of the Coastal Plain. Plant communities including a beech-mixed hardwood community are described from quarter-point samples of the canopy and subcanopy trees plus five m and one m releve quadrats of the shrub and herb vegetation. A floristic analysis has determined that a number of the species in the area represent range extensions, and some, such as *Galax urceolata* and *Phyrma leptostachya*, are also somewhat disjunct from their known distributions.

(116)

The Great Valley and Central and Northern Blue Ridge National Natural Landmarks

H. R. DESELM, G. M. CLARK AND B. C. CONDLEY
University of Tennessee

The Heritage Conservation and Recreation Service has contracted with the University of Tennessee to conduct a survey of the Ridge and Valley and central and northern Blue Ridge Provinces to locate and describe the potential National Natural Landmarks. The Association membership, among other people, are being asked to recommend areas. A parallel system of landscape/vegetation classification is being devised.

(117)

Leaf Litter Decomposition Rates in the Great Dismal Swamp, Virginia

FRANK P. DAY, JR.
Old Dominion University

Leaf litter decomposition rates are being measured by the nylon bag technique in four plant communities in the Dismal Swamp. The communities differ primarily in species composition and frequency and duration of flooding. A preliminary examination of the data suggests that decomposition rates are highest for mixed species litter on the more extensively flooded sites, which also have higher soil and water pH's. Frequent flooding results in matting and moistening of the litter. Algal blooms on the flooded sites may also promote decomposition through nutrient enrichment of the litter. Tupelo gum (*Nyssa aquatica* L.) leaves decomposed faster than the other dominant species' leaves, oaks (*Quercus* spp.), cypress (*Taxodium distichum* (L.) Richard) and Atlantic white cedar (*Chamaecyparis thyoides* (L.) BSP.). Several years of data will be obtained to evaluate what is expected to be highly significant annual variation.

(118)

Pollen Analysis of Mississippi Honey Samples

MEREDITH H. LIEUX
Louisiana State University

Preliminary pollen analysis of honey samples collected from the ten beekeeping areas of Mississippi indicates production of both mixed floral and unifloral samples. The unifloral honeys that have been identified at this stage in the study are those of rattan vine, *Berchemia scandens*; willow, *Salix* spp.; white clover, *Trifolium repens*; soybean, *Glycine max*; wild grape, *Vitis* spp.; holly, *Ilex* spp. and poison ivy, *Rhus toxicodendron*. Rattan vine and willow appear to be the major unifloral contributors with white clover, soybean, holly, wild grape and poison ivy of minor importance in unifloral production. This determination is based on the definition of a unifloral honey as one in which one plant species contributes over 45% of the grains in a sample. A direct correlation is assumed between a plant's nectar contribution to a honey and its pollen contribution.

(119)

Biomass Maps for Southeastern Arboreal Taxa

HAZEL R. DELCOURT
Oak Ridge National Laboratory and
University of Tennessee*

DARRELL C. WEST
Oak Ridge National Laboratory

Population distributions of tree taxa in the Southeastern United States have been mapped using current data compiled from the USDA-Forest Service Continuous Forest Inventory (CFI). Growing stock volumes on commercial forest land for all tree taxa included in the CFI have been compiled by county for this region. These volumes have been recalculated for each taxon in m³/ha of commercial forest land for each county. The resulting contour maps illustrate the current volume distributions of important tree taxa throughout the Southeast. Comparisons of these maps with physiography, soils, and climate show that distinctive assemblages of arboreal taxa occur in discrete physiographic provinces delineated by these environmental factors. Appropriate statistical techniques will be employed to quantify the relationships of assemblages of tree taxa as well as populations of individual tree taxa to environmental gradients across the Southeast. *Research sponsored by NSF under Interagency Agreement No. DEB-77-26722 with the U.S. Department of Energy under Contract W-7405-eng-6 with Union Carbide Corporation.

(120)

Reproductive Strategies of Cattails (Typhaceae) Under Increased Environmental Temperatures

DIANE E. HEIM AND REBECCA R. SHARITZ
Savannah River Ecology Laboratory

Differences in reproductive strategies of cattail species (*Typha latifolia* and *T. domingensis*) were investigated

in populations occurring along a thermal gradient in an industrial cooling reservoir. Variations in vegetative propagation and seed production were examined in stands of both species growing at different temperatures. Seed weight increases, but seed set is diminished at higher temperatures, and there is greater vegetative reproduction. The significance of these reproductive strategies will be discussed.

(121)

The Distribution and Mobility of Lead in Phloem of *Ailanthus altissima* (Simaroubaceae)

WENDELL P. CROPPER, JR. AND HARVEY L. RAGSDALE
Emory University

Four *Ailanthus* trees were collected in March, 1978, for determinations of lead distribution in above-ground phloem and wood. Lead analysis was accomplished using flameless atomic absorption spectrophotometry. Branch phloem concentrations ranged from 1.9 to 3.4 micrograms of lead per gram dry weight (ppm) with no apparent pattern due to age or branch type (primary vs. secondary branches). Phloem lead concentrations in boles decreased as age increased (2.8-1.2 ppm). Lead concentrations in the bole wood (0.17-0.29 ppm) were lower than phloem concentrations but also showed the decreasing trend. Phloem lead mobility was tested with a series of branch ringing experiments. Experiments conducted in May and September, 1977, indicated no significant lead translocation based on comparisons of lead concentrations in phloem directly above and below each ring. A third branch ringing experiment was designed to account for differential accumulation of dry weight across the ring, as well as lead concentrations.

(122)

The Vegetation of a Section of the Obed River Gorge, Cumberland County, Tennessee

P. A. SCHMALZER, C. R. HINKLE AND H. R. DESELM
*University of Tennessee and
Science Applications, Inc.*

The vegetation in a relatively undisturbed section of the Obed River Gorge was sampled by means of fifty-eight 0.04 hectare plots. Agglomerative clustering was used to establish 6 community types. The types distinguished were chestnut oak-white oak, white oak, tulip tree, beech, beech-sugar maple-red maple and river birch types. Reciprocal averaging ordination suggested that the species and communities were distributed along a moisture gradient related to topographic position. Discriminant analysis indicated that factors related to slope position were most important in segregating the communities. Direct gradient analysis further indicated the importance of topographic position to species and community distribution.

(123)

Vegetation Maps for Eastern North America: Full-Glacial to Present

PAUL A. DELCOURT AND HAZEL R. DELCOURT
University of Tennessee

Pollen spectra, including both relative percentage and absolute influx data, were examined from late-Quaternary pollen records distributed across eastern North America. These pollen spectra and corresponding plant-macrofossil data have been used to prepare maps that characterize both distribution and composition of vegetation types within discrete physiographic regions for designated times in the past. Paleovegetation maps for eastern North America are presented for the full glacial (18,000 years Before Present), the late glacial (14,000 yr B.P.), the early Holocene (10,000 yr B.P.), mid-Holocene (5,000 yr B.P.) and late Holocene (200 yr B.P.).

(124)

Effects of Three Management Techniques on Primary Productivity of Two Tidal Marshes in Mississippi

A. A. DE LA CRUZ AND C. T. HACKNEY
*Mississippi State University and
University of Southwestern Louisiana*

Fertilization, harvesting and burning are three management tools employed in marshlands for various purposes. Ten square meter plots established during winter in dominantly *Juncus roemerianus* and *Spartina cynosuroides* marshes were subjected individually to fertilization with 7 kg of 13-13-13 commercial fertilizer by hand broadcast, simulated harvest by clipping close to the ground and burning by controlled application of fire. Six 0.5 m² quadrats were collected monthly from each of the experimental and accompanying control plots for one year. Net primary productivity was estimated by obtaining the difference between maximum and minimum standing crop using a generalized periodic model corrected for die out. Based on these max-min models, NPP for the *Juncus* marsh were 584, 520, 875 and 877 g/m²/yr in the control, fertilized, burned and clipped plots, respectively; for the *Spartina* marsh, NPP were 1737, 1641, 2152 and 1755 g/m²/yr, respectively. There was no significant difference between control and fertilized plots, but burning and clipping enhanced the biomass production during the following growing season in both types of marshes.

(125)

Off-road Vehicle Impacts on Coastal Ecosystems: Grasslands

S. V. SHABICA
*Coastal Field Research Laboratory,
National Park Service*

Off-road vehicle usage of the eastern section of Perdido Key, Florida, has resulted in a haphazard network of vehicular tracks. Rainfall tends to concentrate in many of the trails in topographically low areas. Rather

than being driven through these bodies of water, vehicles are driven around them increasing the widths of the trails from one lane to, in some instances, three lanes. Our investigations show that soil moisture content and degree of compaction differ between impacted and non-impacted areas, that vegetation density and above ground biomass is greater in low impact areas and that below ground biomass appears to vary inversely with impact. Vegetation in the side trails is either absent or stunted and of low density probably reflecting the intermittent impact of the off-road vehicle.

(126)

Suppression of Humoral Responses in Mice Infected with *Trypanosoma cruzi*

DEAN S. CUNNINGHAM AND RAYMOND E. KUHN
Wake Forest University

In vitro anti-sheep erythrocyte (SRBC) and anti-trinitrophenyl (TNP) antibody responses of spleen cells obtained from C57BL/6 mice infected with *Trypanosoma cruzi* were reduced as early as 6 days post-infection and not detectable after 18 days of infection. Lymph node cells had normal antibody responses to SRBC and TNP *in vitro* until the 11th day of infection, after which responses were diminished. By day 31 of infection, lymph node cells were unresponsive to both SRBC and TNP *in vitro*. Not only were the antibody responses of spleen and lymph node cells to T cell-dependent and -independent antigens progressively reduced as the period of infection increases, but, in addition, the effect of lymphoid cell density and antigen dose on antibody production underwent several sequential changes. As the infection advanced, low densities of cultured lymphoid cells and low doses of antigen were ineffective in eliciting a detectable immune response, whereas high densities of lymphoid cells and high doses of antigen resulted in responses approximately equivalent to that observed with normal cells under the same conditions. From the results of cell mixing studies, it appears that a macrophage-like cell plays a major role in the suppressed humoral responses observed in this host-parasite system.

(127)

Recovery of Cytotoddia (= *Toddia*) in Northern Water Snakes from a Cytotoddia-Free Inoculated White Rat

WILLIAM H. YONGUE, JR.
Virginia Polytechnic Institute and State University

Attempts to characterize cytotoddia, a *Cytamoeba*, *Toddia*-like condition in *Natrix sipedon sipedon* has been the focus of continuing investigation since its discovery (*J. Elisha Mitchell Sci. Soc.* 80:2, 1964). Using presence of crystalloid bodies for primary characterization, transfaunation and reciprocal transmission were attempted. Cytotoddia was recovered from apparently cytotoddia-free garter snakes and domestic fowls (*J. Elisha Mitchell Sci. Soc.* 83:3, 1967 and 85:4, 1969). Since then cytotoddia was recovered from a laboratory white rat.

Blood from a naturally infected natrix (HS 1269) was injected (i.p.) into a rat (25 July, 1969). Fourteen days later, blood (erythroblastic) from this rat (crystal free) was injected into 3 cytotoddia-free natrix. All showed low incidences (<1%) of cytotoddia 21 days

post-inoculation. After six weeks only one remained alive (MR269) and the incidence rose to approximately 10% post-ecdysis. By mid-January remission was evident. Following intense hematopoiesis (21 April) relapse occurred (29 April), reached 10% incidence and remained chronic with expiration occurring 20 December. Necropsy suggested bacteremia. Crystal bearing cells were absent.

(128)

Isolations of *Dirofilaria immitis* (Nematoda: Filarioidae) from Alabama Mosquitoes

BONNIE A. BUXTON
Auburn University

Isolations of the dog heartworm, *Dirofilaria immitis*, were made from mosquitoes collected from April-September, 1977, and 1978. Collections were made using 3 dry ice baited C.D.C. light traps operating 1-3 nights per week. A New Jersey light trap also operated nightly throughout the study periods. The traps were set in the immediate vicinity of a hunting-dog kennel with a history of heartworm infection. Isolations of the parasite have been made from *Anopheles punctipennis*, *Aedes sticticus* and *A. vexans*.

(129)

Dirofilaria immitis (Nematoda): Serological Responses of Beagles Throughout the Course of Infection

PETER S. SAKAS AND WILLIAM L. CURRENT
Auburn University

Helminth free beagles were maintained in strictly controlled environmental conditions and were experimentally infected with *Dirofilaria immitis* by subcutaneous and oral routes of inoculation. Sera from each of the groups were studied by electrophoresis to detect differences in major components. Dogs infected subcutaneously displayed significant increases in the levels of B- and α -globulins when compared to the control group. Sera was then subjected to single radial immunodiffusion to determine if this increase was due to a rise in antibody levels. Concentrations of canine IgG and IgM were determined and compared with the life cycle of the parasite. The most marked antibody production was at the time of the second molt (3 months post-infection) and during the period of microfilarial production (6 months post-infection). The highest level of antibody in the infected group was during this period of microfilaremia, and serological tests are now in progress to determine antibody specificity.

(130)

Henneguya adiposa (Myxosporida) in the Channel Catfish: Ultrastructure of the Plasmodium Wall and Sporogensis

WILLIAM L. CURRENT
Auburn University

Plasmodium wall ultrastructure will be discussed, and ultrastructural details of cell-to-cell interactions occur-

ring within plasmodia will be used to reconstruct the major events of sporogenesis in *H. adiposa*. Early sporogenic stages were located in a zone of plasmodial cytoplasm rich in mitochondria, just interior to the zone of pinocytic canals, and later sporogenic stages, including mature spores, were concentrated in the center of the plasmodia. Sporogenesis began with the development of one generative cell, the sporont, by a second, non-dividing cell, the enveloping cell. The sporont and its progeny proceeded through a series of divisions until 10 cells were present within the enveloping cell. Once divisions were completed, the 10 cells became arranged into 2 identical spore-producing units, each consisting of 1 binucleate sporoplasm and 2 capsulogenic cells, all surrounded by 2 valvogenic cells. Later stages of spore development indicated that capsulogenesis, valvogenesis and sporoplasm maturation occurred concomitantly.

(131)

Antennal Structures of Several Species of Bird Lice (Phthiraptera)

RON W. MOBLEY AND MICOU M. BROWNE
North Carolina State University

The external antennal structures of several closely related species of ischnoceran lice were examined by scanning electron microscopy. These lice were recovered from a variety of marine avian hosts which were collected off the North Carolina coast by personnel of the North Carolina State Museum of Natural History. Some of the antennal structures serve sensory functions. The sensilla coeloconica and certain apical sensilla probably serve as chemoreceptors. Other specialized antennal setae serve as thigmoreceptors. These antennal structures will be identified, described and compared. The possibility of using antennal structures as taxonomic features will also be discussed.

(132)

Dynamics of *Fasciola hepatica* (Trematoda) Infected Snail Populations

MICHAEL G. LINDSAY
Louisiana State University

Fasciola hepatica is the cause of large economic losses to the cattle industry in Louisiana. To formulize effective control measures the bionomics of the snail intermediate host must be determined. Beginning in February, 1978, field investigations were undertaken to study the life cycle of *Lymnaea bulimoides*. The primary study area was a farm consisting of reclaimed marsh in southeast Louisiana. In June, 1978, an additional collecting site composed of Mississippi River bottomland was added. To monitor changes in the snail population and variations in the *Fasciola* infection levels, collecting procedures were developed to sample surface and sub-surface habitats. The effects of various ecological factors on the snail population were also studied.

(133)

Two New Monogenetic Trematodes (Gyrodactylidae) from Louisiana Cyprinodontoid Fishes and a Redescription of *Gyrodactylus hargisi* Williams and Rogers, 1971

HERMAN B. GARRETT, II AND DEE S. DUNDEE
University of New Orleans

Two new species of Gyrodactylidae are described from cyprinodontoid fishes in Louisiana: *Swingleus rogersi* from the marsh killifish, *Fundulus confluentus* Goode and Bean, and *Gyrodactylus louisianae* from the sailfin molly, *Poecilia latipinna* (Lesueur). The finding of *Gyrodactylus hargisi* Williams and Rogers on the sheepshead minnow, *Cyprinodon variegatus* Lacepede, from Louisiana constitutes a new locality record for this trematode. *Gyrodactylus hargisi* is redescribed from the type locality in Alabama and compared with the Louisiana *G. hargisi*.

(134)

A New Dermatitis-Producing Schistosome Cercaria From the Apple Snail, *Pomacea paludosa*

WALTER S. LEEDOM AND ROBERT B. SHORT
Florida State University

A new schistosome cercaria with a distinctive pattern of argentophilic papillae is described from the apple snail, *Pomacea paludosa*, collected from Lake Okeechobee, Florida. Administration of the cercariae to the arms of the authors and other volunteers demonstrated that they are capable of producing dermatitis. This represents the first schistosome cercaria from *Pomacea* in the United States as well as the first freshwater dermatitis-producing cercaria in Florida. Attempts to elucidate the life cycle of the cercaria were unsuccessful, though it is believed that the natural definitive host is a bird. Statistical tests were conducted on the relationship between size of cercariae from different snails and size of their respective snail hosts. Cercarial size differed significantly from one snail host to another but was not consistently related to snail size.

(135)

Protein Synthesis During Development of *Schistosoma mansoni* (Trematoda)

KRISTINE H. ATKINSON
Florida State University

Fluorography is a method of detecting minute amounts of newly synthesized proteins via polyacrylamide gel electrophoresis. By labeling parasite tissue with ¹⁴C-leucine, even gels which show no evidence of protein bands by Coomassie blue staining can expose X-ray film to reveal striking bands. Cercarial proteins were pulse-labeled by exposing infected snails to ¹⁴C-leucine in river water; shed cercariae were pooled daily. Although cercariae of the first two days had more label incorporated, there was a transition in the types of proteins labeled

thereafter. Juvenile and adult worms were labeled 24 hr *in vitro*. Mouse serum was coelectrophoresed and produced protein bands with molecular weights similar to those of several major proteins of male and female worms. Juveniles lack a 200,000 dalton protein present in adults. A protein of about 67,000 daltons present in females and mixed juveniles is not apparent in adult males.

(136)

E.M. Observations on Sensory Papillae of *Schistosomatium douthitti* Cercariae (Digenea:Schistosomatidae)

NICHOLAS CONTOS AND ROBERT B. SHORT
Florida State University

Presumed sensory papillae on the body surface of *Schistosomatium douthitti* cercariae were examined by scanning and transmission electron microscopy. At the anterior tip there are 10 pairs of papillae closely associated with the gland duct openings; 9 pairs are unciliated, the tenth appears to be non-ciliated knobs. Most body papillae are unciliated. Small rings at certain locations surround openings presumed to be ciliated pits seen with TEM. Papillae with two cilia, previously not reported from schistosome cercariae, were observed by SEM at two sites. One pair is at the anterior tip, the other pair at the most posterior dorsal position. Unciliated and biciliated papillae, and ciliated pits were confirmed with TEM.

(137)

Some Trematode Parasites of Louisiana Crayfishes

PATRICIA A. BOETTCHER AND KENNETH C. CORKUM
Louisiana State University

About forty species or subspecies of crayfishes occur in a wide variety of habitats in Louisiana. These habitats range from upland, pine drainage systems to the bayous and distributaries of the lower Mississippi River basin. Habitat and community differences were observed over the crayfishes' ranges. Crayfishes were systematically examined for correlations between the larval/adult trematod fauna and the ecology of the crayfish host.

(138)

Population Biology of Host-Parasite Associations: Interaction of the Hydrobiid Gastropod, *Amnicola peracuta*, with a Community of Larval Trematodes

JEFFREY M. LOTZ AND KENNETH C. CORKUM
Louisiana State University

A population of *Amnicola peracuta* located in Beaver Pond Branch, Livingston Parish, Louisiana, was systematically sampled over a period of 12 months. The snails were found to be semelparous with two generations per year. Eggs were laid in late summer; the

cohort developed to maturity by late winter and died soon after reproducing. The second generation hatched in early spring, matured and laid eggs by late summer. Trematode parasites found were: *Homalometron armatum*, *H. sp.*, *Sogandarotrema progeneticus*, *Macrovestibulum sp.*, *Dictyngium chelydrae*, *Caecicola latostoma* and an unidentified cyathocotylid. Trematodes known to occur in the study plot but not encountered during the investigation were *Textrema hopkinsi* and *Azygia sp.* Seasonal and spatial changes in the abundance of the various trematodes and in the assemblage present in the population of snails were observed. The role of the trematodes in regulating the numbers of snails was estimated from the infection rates and from a life table developed for the snail population.

(139)

The Occurrence and Effect of *Thelazia* (Nematoda:Spiruroidea) in Horses

SHARON PATTON, M. D. MCCracken AND K. S. MARBURY
University of Tennessee

The eyes of 34 horses that were presented for necropsy at the University of Tennessee, College of Veterinary Medicine, were examined for eyeworms. *Thelazia lacrymalis* was recovered from 10 of these horses (15 of 67 eyes). Five of the horses had bilateral infection. Although some horses apparently harbor the parasite with no clinical signs, histologically, horses infected with *T. lacrymalis* in this study consistently showed mild to moderate conjunctivitis, mild dacryoadenitis and inflammation surrounding the lacrimal ducts. Two of the 10 infected horses had photophobia and excessive tearing prior to necropsy. On gross examination 2 other eyes had an inflamed irregular mucosa and a third eye had a diffusely reddened sclera. Enlarged lymph nodules were frequently found on the nictitating membrane and upper lid of infected eyes. This study indicates that *T. lacrymalis* should be considered in a differential diagnosis in horses with conjunctivitis.

(140)

The Effects of Extracts of *Culex pipiens* on Exogenous *Plasmodium gallinaceum* in *Aedes aegypti*

CHAI-FANG SHIH AND A. B. WETHERSBY
University of Georgia

Protein fractions of *Culex pipiens*, which is immune to *Plasmodium gallinaceum*, were freeze-dried and fed in 5% sucrose solutions to *Aedes aegypti* which were infected with *P. gallinaceum*. 0.002% solutions were administered at three different periods: 1) from date of infection to dissection of mid-guts, 2) two days prior to infection to dissection and 3) two days prior to infection only. Controls were fed 5% sucrose solutions. Oocysts were counted on day 5. There was a slight reduction in oocysts in group 1 (Avg. 85/97). There was little difference in oocyst numbers between groups 2 and 3, but oocyst reduction in both groups was greatly significant compared to controls (Avg. 2.9/67). Extracts from 4th instar larvae also were highly effective.

(141)

A Survey of the Incidence of an Intraerythrocytic Parasite, *Cytotoddia* (= *Toddia*, Sporozoa) in *Natrix sipedon sipedon* on Garden Island, Michigan, and in a Small Area of Southwestern Virginia

KATHERINE A. BOOKER AND WILLIAM H. YONGUE, JR.
Virginia Polytechnic Institute and State University

Cytotoddia is an intraerythrocytic parasite of poikilotherms. The infection is characterized in all cases by a basophilic staining body and a crystalline mass varying in shape depending upon the host in which it is found. This survey took place during the summer of 1978. One hundred *Natrix* were captured in Michigan and thirty-seven in Virginia. Prepared blood smears were fixed with methanol, stained with giemsa and observed under oil immersion. A higher percentage of infected snakes was found in Michigan (25%) than previous studies have reported (10% or less). Incidence of infection found in the Virginia snakes was 5%, coinciding with values reported in the literature. This is the first record of *Cytotoddia* in Virginia.

(142)

The Usefulness of a ^{51}Cr Release Cytotoxicity Assay to Determine Depression of a Cell Mediated Immune Response by *Dipetalonema viteae* (Nematoda)

CHRISTOPHER J. SMITH AND KENNETH C. CORKUM
Louisiana State University

A ^{51}Cr release cytotoxicity assay has been used extensively in tumor research to determine the effect of a variety of immune effectors on tumor cells. In this study the ^{51}Cr release assay has been modified to provide a direct measure of the effect of *Dipetalonema viteae* on the cell mediated immune (CMI) response of the Mongolian jird, *Meriones unguiculatus*. The ^{51}Cr assay was performed at 6, 12, 20 and 28 weeks post-infection with the third stage larvae in order to determine the effect of the different stages of the parasite's life-cycle on the CMI response of the jird.

(143)

Characterization of Thrombocytes from Intact and Bursectomized Chickens by Application of the $^{51}\text{Chromium}$ Assay

GORE ERVIN AND MARION WELLS
Middle Tennessee State University

The immunological specificities of thrombocytes from bursectomized and intact chickens were compared using the $^{51}\text{Chromium}$ assay. The results of this study indicated no apparent differences between thrombocytes from chickens which have been surgically or chemically bursectomized.

(144)

The Effect of Bursectomy on ATPase Activity in Chicken Thrombocytes

LESLEE DODD AND MARION WELLS
Middle Tennessee State University

Thrombocytes from bursectomized and intact Hubbard chickens were assayed for ATPase activity. The effect of bursectomy on the phagocytic ability of the thrombocyte is discussed.

(145)

Effect of Acclimation Temperature on Malate Dehydrogenase Activity in Channel Catfish, *Ictalurus punctatus*

MARIE I. WRIGHT AND KENNETH B. DAVIS
Memphis State University

The cellular mechanisms by which poikilothermic organisms acclimate to a wide variety of temperatures are poorly understood. The possible mechanisms of adaptation may include the presence of isozymes with different temperature optima or an increase in the number of enzyme molecules. Malate dehydrogenase (MDH) activity was measured from liver extracts of channel catfish acclimated at 10 and 30 C for three weeks. Enzyme activity and electrophoretic analyses were determined at 10, 25 and 30 C. Enzyme activity from both groups of fish increased with increasing assay temperature. Enzyme activity was greater from fish acclimated to 10 and 30 C at all three assay temperatures. Electrophoretic mobility of MDH indicated only one form; however, stain density was consistently more intense in extracts from fish acclimated at 10 C. These data suggest that acclimation to low temperatures in channel catfish results in an increased number of MDH molecules and not induction of an MDH isozyme. The possibility of a thermal effect on substrate affinity (Km) is now being studied.

(146)

Effects of Calcium Chloride and Sodium Chloride on the Inhibition of Nitrite Induced Methemoglobinemia in Channel Catfish *Ictalurus punctatus*

J. R. TOMASSO, M. I. WRIGHT, B. A. SIMCO AND K. B. DAVIS
Memphis State University

Exposure to nitrite results in the conversion of hemoglobin to methemoglobin, which is not capable of carrying oxygen. Environmental chloride has been shown to inhibit methemoglobin formation in fish, offering a protective effect against nitrite toxicity. Channel catfish obtained from the Southeastern Fish Cultural Laboratory in Marion, Alabama, were simultaneously exposed to various environmental nitrite and chloride levels (as either CaCl_2 or NaCl) in dechlorinated tap water (40 ppm total hardness, 109 ppm alkalinity, 4 ppm chloride, 21-24 C). Methemoglobin levels in fish exposed to 2.5 ppm nitrite and 30.3 ppm chloride for 24 hrs did

not significantly differ from control levels ($2.7 \pm 1.0\%$ S.E.), while unprotected fish produced $27.8 \pm 2.8\%$ methemoglobin. Exposure to 10 ppm nitrite and 60.7 ppm chloride resulted in methemoglobin levels similar to controls ($0.4 \pm 0.3\%$), while most unprotected fish died. Fish exposed to 10 ppm nitrite and 15.2 chloride as CaCl_2 had significantly lower methemoglobin levels (53.5 ± 3.4) than fish exposed to 15.2 ppm chloride as NaCl (68.3 ± 3.5) and the same nitrite concentrations. Fish exposed to 10 and 20 ppm nitrite and 303.4 ppm chloride, respectively, for 48 hrs did not exhibit elevated methemoglobin levels while most unprotected fish died.

(147)

Hematological Response of Mirror Carp (*Cyprinus carpio*) and Rainbow Trout (*Salmo gairdneri*) to One Week of Extreme Hypoxia

MICKE J. SMITH
Millisaps College

Rainbow trout and mirror carp are ecologically distinct species. Trout inhabit only well aerated water while carp can inhabit very hypoxic waters. Hematological changes may allow an animal to tolerate or adapt to lowering oxygen tensions by improving oxygen uptake by increased oxygen affinity and/or by improving oxygen transport by increased hematocrit or hemoglobin concentration. This study was undertaken to determine the degree to which carp undergo such hematological changes after one week of extreme hypoxia (0.5 ppm oxygen) as compared to trout after one week of extreme hypoxia for trout (2.5 ppm oxygen). It was found that trout and carp have similar hematocrit and hemoglobin concentrations which do not show a significant change after a one week exposure to hypoxia. Carp blood has a lower P50 (oxygen concentration at which 50% of the hemoglobin is saturated) and, therefore, a higher affinity for oxygen than trout blood. However, hypoxia had no significant effect on the hemoglobin-oxygen affinity of either species. These results indicate that hematological changes may not be as important to long term hypoxic tolerance or adaptation as indicated by test using a short term exposure.

(148)

Development of Epiphyseal Plates in Long Bones of Pharaoh Quail (*Caturnix caturnix japonica*)

D. I. PAV, J. L. ROBERTSON AND F. J. ALSOP
East Tennessee State University and Kingsport University Center

There are only scattered accounts of development, retention and closure of avian epiphyseal plates in the available literature, and they deal almost exclusively with the domesticated chicken. From a larger on-going research on several bird species, we are presenting the bone study on the precocial pharaoh quail. Our experimental series consists of twelve quail groups ranging from four days before hatching to five months after hatching. The appendicular skeleton is histologically examined, the cellular elements are identified and the structural bone architecture is described. The comparative differences with the mammalian long bone development are noted.

(149)

Participation of Central Nervous System Anesthetics in the Cold Shock Syndrome of Freshwater Fish

S. R. LARRICK, D. S. CHERRY AND J. CAIRNS, JR.
Virginia Polytechnic Institute and State University

Fish that are attracted to thermal discharges may be subjected to an abrupt decrease in water temperature when the source of heat is removed. Cold shock mortality may be induced by inhibition of the central nervous system (CNS) in the regulation of homeostatic mechanisms during stress. Research was carried out in a field laboratory at the Glen Lyn Power Plant in Virginia to investigate the effect of two fish anesthetics, tricaine methane sulfonate (TMS) and quinaldine, which may influence CNS involvement of bluegill sunfish (*Lepomis macrochirus*) subjected to cold shock. The critical thermal minima (CTMin) were determined by transferring groups of ten bluegills acclimated at 20°C to chilled tanks at either 10, 8, 6, 4 or 2°C. The CTMin, calculated by probit analysis, for untreated fish and fish exposed to 75 mg/l TMS and 40 mg/l quinaldine were 5.98, 6.39 and 6.03°C, respectively. The similarity between these values suggests that these anesthetics do not appreciably affect homeostatic responses initiated by the central nervous system. The influence of other potential homeostatic mechanisms upon cold shock mortality are discussed.

(150)

Determinations of Cardioactive Principles in the Venom of *Bufo americanus* with ³H-cholesterol

CATHY SHAHEEN AND WILLIAM B. KEITH
University of Mississippi

This is part of a study examining the insensitivity of the bufagous snake, *Heterodon*, to ingested toad venoms; this insensitivity to toxic principles could have implications relative to the death-feigning behaviour of the genus. Labelled cardioactive principles, which are synthesized in the parotids and skins of ³H-cholesterol treated toads, are extracted and separated using chromatographic procedures.

(151)

Spectrofluorometric Determinations of Catecholamine Levels in the Hognose Snake, *Heterodon*

CATHY SHAHEEN AND WILLIAM B. KEITH
University of Mississippi

The death-feigning behaviour of *Heterodon* as well as its disproportionately enlarged adrenal is well known. McDonald (1974) presents data which could indicate that death-feigning in this genus is a bona-fide parasympathetic syndrome with accompanying bradycardia. This study reports attempts to link death-feigning behaviour of *Heterodon* with fluctuating levels of serum catecholamines.

(152)

³H Cortisol Binding by Mouse Thymocytes: Relationship to Gonadectomy and Thymic Involution

PATRICIA A. GRESHAM AND WILLIAM B. KEITH
University of Mississippi

Delayed thymic involution occurs in gonadectomized rats. Peak cortisol binding to thymic tissue in intact animals corresponds with the onset of sexual maturation and thymic involution. This paper reports data on the relationship of these two observations in C57/BL and C43/GR strains of mice, through the measurement of ³H cortisol binding in intact and castrated animals at various ages and degrees of involution.

(153)

The Effects of Tryptophan and Protein Deficient Diets on Animals Exposed to Mycotoxins

T. D. KIMBROUGH, G. C. LLEWELLYN, K. REYNOLDS AND N. COATS
Virginia Commonwealth University

A study was conducted using adult gerbils (*Meriones unguiculatus*) based on the effects of dietary depletion of L-tryptophan and protein upon animals concurrently fed meals containing a number of secondary metabolites of *Aspergillus parasiticus*. During two separate experiments, half of the experimental animals were returned after 50 days of maintenance on tryptophan and protein-free diets, respectively, to control diets containing a complete protein complement plus mixed aflatoxins (AFT). The remaining experimental animals (Non-AFT) were returned to balanced control diets. The AFT-treated animals were maintained until the effects of the aflatoxins were lethal. Non-tryptophan deficient control animals (TRP Con-AFT) and non-protein deficient (PRO Con-AFT) animals were also fed control diets of mycotoxins. Both groups showed an immediate and rapid weight loss until death. Tryptophan deficiency provided a 12-day "protective" period against the toxic response as recorded by weight loss. After this period they showed a rate of body weight loss comparable to that of the TRP Con-AFT animals. No such "protective" period was apparent in data recorded from the PRO Con-AFT animals.

(154)

Effects of X-rays on the Mitotic Rhythm in Mouse Bone Marrow

SHIRLEY A. BORTNER AND PRISCILLA S. RUSHTON
Memphis State University

The bone marrow of mature, male DUB(ICR) mice kept on a 12-12 photoperiod was examined for dividing cells at various times of the day. The resulting mitotic indices show a pronounced rhythm with one peak during the early light period. Since these animals are nocturnal, this peak of mitosis occurs during the period when locomotor activity is lowest. To check for radiation induced mitotic delay, mice were irradiated and the

mitotic index determined at various time intervals. Following an exposure to 400 R of x-rays at the mid-point in the light cycle, the mitotic index remained depressed for 24 hrs and then showed a peak 4 hrs later than the controls. Additional mice were exposed to 200 R of x-rays, and the peak of mitosis occurred 2 hrs later than the controls. It may be concluded that the extent of mitotic delay is proportional to radiation dose.

(155)

Studies of a Valine-Desistant Mutant of *Escherichia coli* K-12

YARED WOLDEYESUS AND ARTHUR L. WILLIAMS
Murray State University

A mutant of *E. coli* K-12 was isolated as being resistant to 1mM valine and glycyl-valine (Val^R). It was found that the isoleucine-valine biosynthetic enzymes were derepressed in this mutant as compared to the wild type, and the acetohydroxy acid synthase was less sensitive to feedback inhibition by valine than the wild type enzyme. Surprisingly, it was observed that this mutant was also resistant to azaleucine, a leucine analog. P1 transductions indicated that both Val^R and azi^R lesions were linked to ilv-region (66%). Since azi^R strains alone have been found to possess altered tRNA^{Leu}, tRNA from this mutant was subjected to column chromatography. The results indicated that there were little (if any) differences in amounts or chromatographic mobility of tRNA^{Leu} but showed an alteration in the time-course of *in vitro* aminoacylation of unfractionated tRNA^{Leu} as compared to the parental strain.

(156)

Ethnic Variation In Palmar Flexion Creases Frequencies

WILLIE J. CAFFEY AND SR. GRACE MARY FLICKINGER
Xavier University

Simian and Sydney creases are both variants of the normal palmar flexion creases. Both of these variants have been associated with genetic disorders. To date, no racial comparisons of the frequencies of these creases has been made. In this study, the frequencies of simian and Sydney creases in three groups of North American Blacks will be compared with those observed in Apache, Choctaw and Navajo Indians, as well as with Caucasians. The intergroup frequencies will be subjected to a Chi-square analysis for significance.

(157)

A Comparison of a-b Ridge Counts Within and Between Three Ethnic Groups

SR. GRACE MARY FLICKINGER AND CATHY BRADFORD
Xavier University

The a-b ridge count in dermatoglyphics is highly heritable. This trait is frequently utilized in racial studies because it exhibits racial variation. In this study, a-b ridge counts were obtained for three separate American Black populations. These values were then compared with data reported for three Amerindian groups, as well

as with Caucasian groups. General racial trends were discussed.

(158)

Ethnic Variation in High Frequencies of Similar Digital Patterns

SR. GRACE MARY FLICKINGER AND ANTHONY JONES
Xavier University

High frequencies of similar digital patterns are associated with certain genetic diseases. "Normal" frequencies are based on data obtained in studies involving Caucasians. Racial variation in dermatoglyphic traits has been established for quite some time. In this study the number of individuals with high frequencies (5 or more) of the same pattern is determined for American Blacks and for Apache, Choctaw and Navajo Indians. These values are compared with similar data available for other ethnic groups. The significance of these findings in clinical dermatoglyphics is discussed.

(159)

The Role of Methyl Groups in Differentiation of Cardiac Tissue in Cultured Chick Embryo Explants

M. L. SMITH AND G. W. KALMUS
East Carolina University

Methyl groups have been implicated in the process of differentiation. L-menthionine and S-adenosyl-L-methionine, both known methyl donors, were used at various concentrations to treat post-nodal pieces (PNP's) of the chick blastoderm. DL-homocysteine and S-adenosyl-L-homocysteine, demethylated derivatives of L-methionine and S-adenosyl-L-menthionine, respectively, were used as controls. PNP's were obtained by incubating fertile White Rock Cross eggs for 18 hrs and transecting isolated blastoderms at 0.6 mm posterior to Hensen's node. PNP's were cultured for 4 days on whole egg extract-Ringer-agar medium and treated prior to incubation with a drop (0.03 ml) of chick Ringer's solution containing test agents. Control PNP's were similarly treated but without test agent. Differentiation was defined in functional terms as pulsatile tissue. Morphological differentiation was confirmed by light and electron microscopies. PNP's treated with methyl donors showed significant amounts of pulsatile (pre-cardiac) tissue when compared to control PNP's. These findings suggest that methyl groups are necessary for differentiation in this model.

(160)

Development of the Cytopharyngeal Pouch During the Transformation of the Ciliate, *Tetrahymena vorax*

P. E. RYALS, H. E. SMITH AND H. E. BUHSE, JR.
*University of Alabama and
University of Illinois, Chicago*

The development of the cytopharyngeal pouch in *Tetrahymena vorax* has been studied during the transformation of the microstome to the macrostome form.

Populations of the small, saprozoic microstome form were synchronously transformed into the larger, carnivorous form by a series of heat-shocks followed by washing the cells into buffer (Buhse and Rassmussen, *Comp. Rend. Trav. Lab., Carlsberg*, 40:59, 1974). The transformation process from microstome to macrostome includes resorption and replacement of the oral apparatus, the development of a cytopharynx and the formation of a metastable organelle, the cytopharyngeal pouch, which occupies approximately 80% of the cell volume. Pouch development is accompanied by a realignment of the cellular ultrastructure. Changes include nuclear displacement, packing of E.R. around the pouch membrane and assembly of microtubule-microfilament supportive arrays. Pouch formation appears to be preceded by the accumulation of smooth surfaced membranes into a small vacuole which enlarges by addition of more membrane.

(161)

Stereological Studies of Ventricular Myocardial Cells During Postnatal Development of the Rat

WAYNE T. SCOTT AND HARRIETT E. SMITH
University of Alabama

Hyperplasia in rat ventricular myocardial cells ceases shortly after birth, and subsequent growth is due to hypertrophy of existing cells. Normal postnatal growth of the left ventricle is disproportionately greater than that of the right ventricle due to the increased work load placed on the left ventricle. We have compared the behavior of cellular structures in left and right ventricular myocardial cells of rat during the postnatal period using quantitative morphometry. The hearts used in these studies were fixed by coronary vascular perfusion with an isotonic OsO_4 solution and stained *en bloc* with uranyl acetate, followed by dehydration and embedding in Spurr's low viscosity resin. Cross-sections of left and right ventricular myocardial cells in rats ranging in body weight from 50 to 400 g were used to measure mitochondrial volume, myofibrillar volume and nuclear volume per unit cell volume.

(162)

Measurement of Changes in the Frequencies of Haploid and Merodiploid Cells in Bacterial Populations Exposed to Mutagenic Agents

G. R. HOFFMAN, RUTH KIRVEN AND LESLIE MORRISON
Meredith College

Simple procedures have been described for distinguishing bacteria carrying a genetic duplication of approximately 30% of the chromosome from their haploid counterparts in *Salmonella typhimurium*. The procedures are based upon both colony morphology and growth rates on L-malate. The duplication occurs in haploid cells at the high frequency of approximately 10^{-1} per cell plated and is readily lost from merodiploid strains. Owing to the genetic instability, all populations are mixtures of haploid and merodiploid cells. We have found that a variety of mutagenic agents stimulate the

rate of duplication formation in haploid cells and duplication loss from merodiploid cells. Calculations are presented demonstrating that either a net increase in duplication frequency, a net decrease in duplication frequency or equilibrium between duplication formation and loss may occur in a mutagenized bacterial population depending upon the initial composition of that population.

(163)

Suppression of Lymphocyte Reactivity to SV40 Transformed Cells by Pregnant Hamster Spleen Cells

L. R. ADKISON, W. A. WEPPIER AND J. H. COGGIN, JR.
University of South Alabama

SV40 transformed tumor cells in hamsters have been found to have antigens cross reactive with antigens temporally expressed on fetal tissues. Adoptive transfer assays in this laboratory have shown that lymphocytes from 10 day primiparous hamsters are cytotoxic to SV40 transformed tumor cells (WF5-1) whereas lymphocytes from multiparous hamsters possess less cytotoxicity. This suggests a suppressor element is present during subsequent pregnancies that reduces the reactivity of pregnant lymphocytes toward fetal antigens on tumor cells. Using a lymphocyte transformation assay, lymphocytes from pregnant animals were found to be incapable of responding to preparations of hamster fetal tissue. In addition, a suppressor element can be demonstrated in spleen cell populations of both prima- and multiparous hamsters during pregnancy that is capable of reducing the response of lymphocytes sensitized against SV40 antigens. The cell population responsible for this suppression is a non-adherent population of lymphocytes.

(164)

Cytogenetic Analysis of Human Malignant Melanoma Cells *In Vitro*

D. W. BATH, K. HASHIMOTO AND T. KANZAKI
*Austin Peay State University and
Memphis Veterans Administration Hospital*

Both standard and trypsin banded karyotypes were constructed of four different cell cultures: uncloned melanoma cells before and after inoculation into mice and two cloned lines (III and IV). Approximately 65% of the uncloned cells before inoculation into mice had more than 90 chromosomes with the polyploidy involving all chromosome groups. Additionally, two marker chromosomes, M_1 and M_2 , were observed respectively in 66.7 and 24.1% of the cells. After inoculation into mice, the frequency of chromosome M_1 increased to 82.9%. The clone III line was observed to have less than 90 chromosomes in 94% of the cells and the M_1 chromosome in 70.5% of the cells. Sixty-nine percent of cells from clone IV had between 70 and 90 chromosomes with the M_1 chromosome in 74.5% of the cells. The marker chromosome has been identified as an $11q+$ translocation.

(165)

Effects of Delta-9-Tetrahydrocannabinol on Growth and Metabolism of Microorganisms

P. CUNNINGHAM, R. DANIEL, D. ABBOTT AND C. ROTHE
Murray State University

It has been shown that delta-9-tetrahydrocannabinol, the major euphoric principle of marihuana, has an inhibitory effect on the division cycle of both prokaryote and eukaryote cell systems. We have investigated the effects of THC on three microorganisms, each with different physiologic capabilities: *Bacillus cereus*, *Streptococcus faecalis* and *Tetrahymena pyriformis*. Cultures of these organisms were challenged with sublethal doses of THC and analyzed in terms of general morphology, division rates and macromolecular synthesis. Data obtained show that the response to THC challenge involves an increased generation time and an associated decrease in macromolecular synthesis. It appears that THC can be metabolically detoxified by those organisms having extensive oxidation pathways.

(166)

Teaching Large Classes Humanistically (Effectively)

WILLIAM J. KOCH
University of North Carolina

Several years ago I felt compelled to set about the task of humanizing my large general botany course, addressing directly the human nature of the participants in the course. And what a difficult task it was because there were no guidelines. It seemed to me then, and it still does, important to explore humanistic methods for resolving problems of mass education: humanistic options and alternatives especially valid for a mass of people lacking commitment to the natural sciences. Why develop humanistic techniques? We live in a fearsome world, one with more problems than solutions, and students have terrible feelings of loneliness and alienation. We need innovations in our courses that develop self-actualized persons willing and able to interact with the world in intelligent ways, and we are experimenting with methods designed to facilitate this.

The design of our course changes every semester, but certain of the "humanizing techniques" work well enough to remain, and some of these will be shared with you. The models I use are: 1) "Willie Koch's Spiral Loop: A Teaching-Learning Chain," 2) "A Learner's Hierarchy of Needs," 3) "Mechanistic and Humanistic Organization Contrasted" and 4) "The Humanistic-Mechanistic Continuum."

(167)

Certain Aspects of Age and Growth of Speckled Hind, *Epinephelus drummondhayi* (Serranidae)

ROBERT H. MATHESON, III
National Marine Fisheries Service

The speckled hind, *Epinephelus drummondhayi*, is one representative of a complex semi-tropical fish community located in the South Atlantic continental shelf area

off the coasts of North and South Carolina. Otoliths were extracted and examined to see if they could be used to age the species. The oldest fish aged to this date was XV, 879 mm total length. Back-calculated mean lengths were derived using the following equation: $TL = 9.5058 (OR) + (-118.8011)$, $N = 390$, $r = 0.97$ where TL = total length and OR = otolith radius. Due to small sample size for ages XI through XV, back-calculations were restricted to the first ten years, $N = 214$: Age I-166.70, Age II-295.07, Age III-383.23, Age IV-452.43, Age V-512.59, Age VI-561.20, Age VII-611.10, Age VIII-645.08, Age IX-682.68 and Age X-733.07. Preliminary investigation concerning correlation between ages determined by reading "whole" otoliths with those that have been laterally cross-sectioned appear to be justified. Length-weight relationships were analyzed with the following results: $W = 1.1 \times 10^{-8} L^{3.0883}$ for overall data; $W = 2.3 \times 10^{-5} L^{2.0928}$ for offshore (> 25 fathoms) Cape Hatteras, N.C.; $W = 0.7 \times 10^{-5} L^{3.1090}$ for offshore Cape Lookout, N.C.; $W = 1.1 \times 10^{-8} L^{3.0651}$ for inshore (> 25 fathoms) Cape Fear, N.C.; $W = 1.4 \times 10^{-5} L^{3.0074}$ for offshore Cape Fear, N.C.; $W = 2.1 \times 10^{-8} L^{2.9012}$ for inshore Cape Romain, S.C.; and $W = 1.0 \times 10^{-5} L^{3.1059}$ for offshore Cape Romain, S.C., where W = weight in kg and L = total length in mm.

(168)

The Role of Chromosomal Rearrangements as Isolating Mechanisms in *Noturus* (Ictaluridae)

WILLIAM H. LEGRANDE
University of Wisconsin, Stevens Point

Analysis of karyotypes of 20 of the 24 described species of madtoms (*Noturus*) indicates dramatic interspecific karyotypic diversity. Karyotype evolution appears to have involved both Robertsonian and non-Robertsonian rearrangements. Of the 20 species studied, only 3 allopatric species pairs exhibit karyotypes which cannot be distinguished confidently; however, there is no greater tendency toward karyotypic dissimilarity in sympatric vs. allopatric species pairs. While it is probable that karyotypic differences among madtoms are sufficient to serve as postmating isolating mechanisms by inducing sterility or reduced fertility in F_1 's, evidence suggests there has been insufficient disruption of the madtom genome to prevent hybridization. The scarcity of *Noturus* hybrids is probably a function of strong premating (ethological or ecological ?) isolating mechanisms. Chromosomal differences developed in madtom stocks during early stages of divergence may have prevented introgression while some efficient premating mechanisms developed.

(169)

Osteology and Evolutionary Relationships of the Zeiform Family Caproidae

STEVEN J. ZEHREN
University of Alabama, Birmingham

Specimens of six species of the zeiform family Caproidae (*Capros aper*, *Antigonia capros*, *A. rubescens*, *A. eos*, *A. malayanus* and *A. combatia*) were cleared and stained for a comprehensive osteological examination. A character state tree (showing the sequence of change in states) was constructed for each character used in

the investigation. The primitive vs. derived condition of character states in the Caproidae was determined by making out-group comparisons (including an examination of various members of the Order Beryciformes). On the basis of derived character states, it was possible to determine the evolutionary relationships among the six caproid species. A brief discussion of the relationships of the Caproidae to other zeiforms is also included.

(170)

Karyology of the Northern Gulf of Mexico
Poeciliidae (Cyprinodontiformes)

C. LUCKNER, L. MADSEN AND A. DOUCETTE

Louisiana State University

Chromosome counts were determined for the three species of Poeciliidae from the northern Gulf of Mexico: *Gambusia affinis*, *Heterandria formosa* and *Poecilia latipinna*. Slides of hemopoetic and gill tissues were prepared by the hypotonic and squash techniques. The results are compared to karyotypes determined for other members of the Poeciliidae and discussed in terms of phylogenetic relationships.

(171)

A Preliminary List of the Fishes of Clark Creek
in Western Mississippi with a New Record
for the Southern Redbelly Dace,
Phoxinus erythrogaster

R. C. CASHNER, F. L. PEZOLD AND J. M. GRADY

University of New Orleans

Clark Creek is one of the lowermost tributaries of the Mississippi River. The stream has a length of 5.9 km, a drainage area of 37 km² and is wholly contained in the southern portion of Wilkinson County, Mississippi. As expected, the smaller Clark Creek does not support the species richness of adjacent, larger tributaries of the lower Mississippi River, like Buffalo Bayou, Bayou Sara and Thompson Creek. Among the 25 species recorded thus far is a new record for the southern redbelly dace, *P. erythrogaster*, which represents over a 100-mile extension from its previous known southern limit in the Yazoo River drainage, Warren County, Mississippi. Two other noteworthy additions of species that show discontinuous distribution patterns in the eastern tributaries of the lower Mississippi are the stoneroller, *Campestris anomalum*, and the harlequin darter, *Etheostoma histrio*. Also, two cyprinid hybrid combinations, *C. anomalum* × *Nocomis leptoccephalus* and *C. anomalum* × *P. erythrogaster* have been recorded from Clark Creek during this survey.

(172)

Fishes of the Duck River

DAVID L. NIELAND

University of Tennessee

The Duck River has the most diverse ichthyofauna within the Tennessee River System. It has a length of 422 km and drains approximately 7,000 sq km of the

eastern and western Highland Rim and the Nashville Basin physiographic regions of middle Tennessee. Over 350 collections of fishes have been made since the 1930's yielding 133 species from 19 families. The Cyprinidae and Percidae dominate the fauna with 37 and 35 species, respectively. Eighty-two species have been collected from one locality. Recent records add *Etheostoma camurum*, *E. nigrum* and *E. tippecanoe* to the known fauna. Collections of two sympatric forms of *Notropis volucellus* may warrant the elevation of *N. volucellus wickliffi* to specific status. Affinities of the lower Duck River and Coastal Plain faunas are also discussed.

(173)

Notes on the Distribution and Life History
of the Slackwater Darter, *Etheostoma
boschungii* (Percidae)

HERBERT BOSCHUNG

University of Alabama

An extensive search for slackwater darters was conducted in the south bend of the Tennessee River. Reproductive schedules and behavior were observed during the winters of 1975-76 and 1978-79. The slackwater darter requires two distinctly different, but necessarily adjacent, critical habitats in order to complete its life cycle. The non-breeding habitat is typically a slow-flowing stream with silt and gravel bottom and with an accumulation of organic detritus. The breeding habitats are seepage areas in open pastures. Eggs are laid "on land" in the submerged part of *Juncus*. The larvae, after reaching about 12 mm SL, return to the adjacent streams. Slackwater darters have a disjunct distribution in tributaries to the Tennessee River, namely Cypress Creek, Flint River, Swan Creek, Shoal Creek and headwaters of Buffalo River. The darter is uncommon except in certain parts of Cypress Creek.

(174)

Ichthyoplankton Survey of Nearshore Gulf
Waters Off Southeastern Louisiana, July,
August and December, 1973

H. J. WALKER, JR. AND F. M. TRUESDALE

Marine Ecological Consultants and
Louisiana State University

Horizontal and vertical hauls with a 100 cm plankton net (0.505 mm mesh) yielded 57 kinds of larval and juvenile fishes representing at least 30 families. Estuarine dependent species comprised the majority of the ichthyofauna in July-August, non-estuarine dependent species in December. Total numbers of fishes per m³ (horizontal tows) were: August, 4.8; December, 2.7; July, 2.6. The most abundant species in July-August samples, in order of decreasing abundance, were *Anchoa mitchelli*, *Opisthonema oglinum*, *Chloroscombrus chrysurus* and *Stellifer lanceolatus*; the Sciaenidae was the most speciose family (six species). In December samples, *Brevoortia patronus* was predominant, *Leiostomus xanthurus* a distant second; the Myctophidae was most speciose (at least seven species). The presence of myctophids and gonostomatids in December samples suggested a shoreward movement of offshore water.

(175)

The Dry-Forest Herpetofauna in Honduras:
Composition, Distribution and Dispersal

LARRY D. WILSON
Miami-Dade Community College

The makeup, distribution and dispersal patterns of the herpetofauna of the dry forests (Tropical Arid Forest, Tropical Dry Forest and Subtropical Dry Forest formations of Holdridge) are examined. One hundred six species occur in these forest types representing 52.5% of the total herpetofauna of the country. Dry forest types occur on the Pacific lowlands and north into river valleys whose waters exit into the Gulf of Fonseca on the Pacific side. They also occur in a series of valleys (Comayagua, Otoro, Sula and Aguan) extending to the Caribbean coast. The dry-forest herpetofauna typical of the Pacific coast of Central America has utilized these dry valleys to disperse northward onto the Caribbean versant, eventually merging with the wet-forest herpetofauna of the Caribbean coast.

(176)

Terrestrial Activity of Striped Mud Turtles,
Kinosternon baurii

MARK L. WYGODA
University of Florida

Terrestrial movements of a population of striped mud turtles, *Kinosternon baurii*, were monitored from March, 1975, through April, 1976, using trailing devices and terrestrial and aquatic traps. Studies were centered around a riverine forest pond and adjacent seasonal swamps in southwest Florida. A total of 67 turtles were marked and captured 157 times. The male to female ratio was 1:2 in the pond and 1:1 in the swamps. Terrestrial activity occurred in three phases (8 March-13 July; 25 September-17 December; 16 February-30 April) during the period studied. Population size in the pond was correlated with water depth, demonstrating this species' preference for shallow water or terrestrial habitats. Terrestrial activity was positively correlated with the incidence of rainfall, and mass migrations were initiated by heavy rainfall. It is suggested that social interactions were responsible for the disproportionate number of males in the pond.

(177)

The Use of Photography to Estimate the Numbers
of Tadpoles in Shallow Breeding Ponds

C. KENNETH DODD, JR.
U.S. Fish and Wildlife Service

The use of photography to estimate the numbers of vertebrates in wild populations is a well established wildlife management technique. However, photography has not been previously used to estimate the numbers of amphibians in breeding ponds. A shallow breeding pond used by the American toad, *Bufo americanus*, was monitored through the breeding season of 1977 in Fairfax County, Virginia. Tadpole clusters were photographed and the resulting pictures were used to estimate both the numbers of tadpoles and numbers of adult females that spawned. The merits and disadvantages of the tech-

nique will be discussed as well as its application in the management of populations of endangered and threatened species.

(178)

Demographic Control of *Anolis carolinensis*
(Reptilia, Iguanidae)

ROHN WALTER
Brevard Community College

A parasitic insect of the family Tachnidae was found to be prevalent in a population of *Anolis carolinensis* in central Florida. In all cases so far observed, this parasite produces a fatality rate of 100% in those lizards infected. Several specimens of the host species were found post-mortem; others, discovered before death and maintained for a period of time, showed the progressive consumption of the hosts as well as the rapidity of the destructive process. An average rate of infestation was determined to consider the importance of this insect as an enemy of *A. carolinensis* and other species indigenous to the area under observation.

(179)

Geographic Variation in the Bahamian Brown
Anole, *Anolis sagrei* (Dumeril and Bibron)

PHILLIP E. WYLIE
East Carolina University

The specific allocation of the Bahamian Brown Anole, *A. sagrei*, is determined. The Bahamian populations were previously accorded specific or subspecific status or synonymized with one or more insular or mainland populations. The taxonomic conclusions are based on the analysis at 23 morphometric and non-quantifiable characters from 769 specimens representing 13 insular populations. Individual and geographic variation within the Bahamian populations are delimited and compared with those of the Cuban population. Interpopulational and intrapopulational trends within the Bahamian populations are noted. Analysis of the data definitively confirm that the Bahamian populations are subspecifically differentiated from the Cuban population.

(180)

A Preliminary Survey of Benthic Macro-
invertebrates in a Recently Impounded Reservoir

MARION B. BRAGG AND CLAY M. CHANDLER
Middle Tennessee State University

Benthic macroinvertebrates were collected from Normandy Reservoir, Duck River, Coffee County, Tennessee from May, 1977, through May, 1978. Ekman and Petersen grab samples were taken monthly at three transects to yield a total of 348 samples for the entire study period. Chironomidae, Chaoboridae and Oligochaeta were best represented, and a few specimens of Hydracarina, Hexagenia and Nematoda were present. An initial comparison of pre- and post-impoundment fauna indicates that clams, snails and trichopterans were well-represented before impoundment but were virtually absent after impoundment. *Chaoborus*, found in limited quantity before impoundment, now occurs abundantly

in the reservoir. Decapods, megalopterans and neurop-
terans were found prior to impoundment but were ab-
sent in the reservoir.

(181)

A Survey of the Benthic Macroinvertebrates in Percy Priest Reservoir (Stones River, Tennessee)

RICHARD D. GRAHAM, JR.
Middle Tennessee University

Substrate samples were collected monthly at three
stations between April, 1976, and April, 1977, except for
January and February, 1977, when the lake iced over.
Sampling stations represented the embayment, main-
stream and a major inflow. Seasonal cycles of benthic
macroinvertebrates were compared with available phys-
iochemical data. Lowest pH values and highest tempera-
tures occurred during August, 1976, when the greatest
number of organisms, 1711/m², were found. Decreases
in dissolved oxygen during summer months were paral-
leled by decreases in chironomid larvae and increases
in *Chaoborus* sp. Percentages of the chironomids, *Poly-
pedilum* sp. and *Cryptochironomus* sp., increased when
conditions of low oxygen prevailed. Fifty-seven percent
of all genera were Chironomidae.

(182)

The Distribution and Characterization of a Pigmented Bacterium

M. J. HENCH SUAREZ AND CONRAD E. WICKSTROM
Emory University

The occurrence of an orange pigmented, gram nega-
tive, rod-shaped bacterium known to inhabit hot spring
mats was examined in 19 Yellowstone thermal streams
at 35 C and along the thermogradient of 5 springs.
Presence and density of the species was determined by
dilution-plating of homogenized mat collected aseptically.
The organism was present in two springs ($M = 3.3 \times 10^5$,
S.E. = 6.5×10^5 CFU · gAFDW⁻¹; $n = 4$). Six
isolates were cloned for laboratory study. The tem-
perature range for growth in culture was 25-55 C. The
rods measured $0.8-1.6 \times 1.6-2.6$ μ m. The bacterium
utilized several amino acids as sole growth substrates in
a mineral salts medium, while growth in the mineral
medium with carbohydrates required supplemental or-
ganic nitrogen. This facultative anaerobe grew in diag-
nostic carbohydrates media without acid or gas produc-
tion. A methanol extract of cells absorbed maximally
at 465 nm, indicating a composition of carotenoid pig-
ment(s). Completed diagnostic tests permit tentative
assignment of this organism to the genus *Flavobacterium*.

(183)

Nitrogen Fixation by Blue-Green Algae in Hot Springs

CONRAD E. WICKSTROM
Emory University

Nitrogen-fixation activity was surveyed in some alka-
line thermal springs of Yellowstone National Park.

Light dependent nitrogen fixation within mature algal-
bacterial mats of these springs was measured by the
acetylene-reduction technique. Intact cores of mat were
incubated *in situ* in serum bottles with 0.2 atm generated
acetylene. Appreciable rates of nitrogenase activity were
detected in 10 of 11 streams examined. Mat from 60
and 65 C did not evolve ethylene, while the incidence of
fixation increased with decreasing temperatures from
30% at 50 C to 100% at 30 C. *Mastigocladus lamin-
osus*, a cosmopolitan thermophilic blue-green alga, ac-
counted for fixation at the higher temperatures; species
of *Calothrix* were responsible for most activity at lower
temperatures. The apparent maximum rate of nitrogen
fixation along one thermogradient occurred in a *Calo-
thrix* mat at 40 C. Estimates on active cores ranged
from 6 to 5,500 nmoles N₂ fixed · mg Chl a^{-1} · hr⁻¹.

(184)

Food Resource Partitioning Among Four Species of Sunfish

JOHN M. KIRBY
Virginia Polytechnic Institute and State University

The feeding habits of *Lepomis auritus*, *L. gibbosus*,
L. macrochirus and *L. cyanellus* were investigated in the
Schuylkill River of eastern Pennsylvania. Food resource
utilization and partitioning were examined for these
four fish species by analysis of their stomach contents.
The utilization and partitioning of food resources among
these fish were compared statistically using the Kendall
Rank Correlation Test and a percent similarity index.
The invertebrate composition of the diets of the fish
species were heterogeneous indicating varying degrees of
food resource partitioning. Habitat shifts were deter-
mined not to be important factors in terms of food re-
source partitioning; rather, differences in spatial orienta-
tion within the same habitat acted to partition prey
resources. During periods of prey superabundance, par-
ticularly the sporadic abundance of Psychodidae (Dip-
tera) pupae, the sunfish diets showed increased conver-
gence. The diet convergence indicated a high degree of
niche overlap with no apparent increase in competition
pressure. The plasticity of the sunfish to select the most
abundant food source indicated that switching behavior
played an important role in food partitioning among the
sunfish studied from this riverine system.

(185)

Methods for ATP Extraction — A Review

J. R. CLARK AND J. CA'RNS, JR.
Virginia Polytechnic Institute and State University

K. L. DICKSON
North Texas State University

The quantitative extraction and recovery of adenosine
triphosphate (ATP) from biological materials has been
an increasingly accepted technique adapted for ecological
studies. Based on the rapid degradation of ATP upon
cell death and a rather constant ATP to cell carbon
ratio, investigators utilize ATP analysis of Aufwuchs,
plankton, microbial and sediment samples to estimate
viable community biomass. An array of techniques has
been developed for extracting ATP and estimating the

extraction efficiency. This paper reviews the more commonly employed ATP extraction procedures and discusses problems and assumptions associated with these techniques. Comparisons are drawn from literature information as well as the experience of the authors. It is apparent that the suitability of ATP extraction methods depends on the nature of the biological sample and the intent of the investigation. The most reliable estimates of ATP extraction efficiency are based on the recovery of ATP from known additions of living cells. *Supported by the Department of Energy, #ORO-4939.*

(186)

Effects of Pollution on Protozoan Communities Inhabiting Artificial Substrates in the South River, Virginia

M. S. HENEGBRY, D. L. KUHN, J. L. PLAFKIN,
D. J. CAIRNS AND K. M. HART

Virginia Polytechnic Institute and State University

Polyurethane foam artificial substrates (PF units) were placed at five stations with comparable flow rates in the South River adjacent to Waynesboro, Virginia. Stations were located along a previously delineated pollution gradient. Two PF units from each station were collected and examined for protozoa on Days 0.5, 1, 2, 4 and 7 after placement. Species richness on PF units at Stations 3, 4 and 5 was significantly higher ($\alpha = 0.05$) than at Stations 1 and 2 throughout the study, indicating increased organic enrichment of the river beginning at Station 3. The increase in species richness at and below Station 3 (200 m downstream from the Waynesboro sewage treatment plant) was similar in magnitude to that found when the same section of river was sampled by collecting protozoa directly from the benthos. The PF units appeared to monitor effectively pollution-related changes in protozoan communities. *Supported by a Department of Energy grant [E-(40-1)-4939].*

(187)

Differences in Community Structure of Periphyton at Two Levels in Two Ponds in Western North Carolina

JANE T. CAMERON AND C. B. COBURN, JR.

Tennessee Technological University

From April 1, 1977, to April 1, 1978, periphyton were sampled at the surface and one m with modified Catherwood diatometers. Communities were observed from two locations in each pond. The larger and less eutrophic East Pond varied between levels and sites more than the West Pond. At the dam site *Tabellaria flocculosa*, *Achnanthes* spp., *Navicula subtilissima* and *Eunotia pectinalis* were common at both levels. In addition, *Tabellaria fenestrata* was abundant only at the surface and *Eunotia flexuosa* var. *eurycephala* was abundant only at one m. The inflow site communities had *T. flocculosa*, *Achnanthes* spp., *N. subtilissima* and *E. flexuosa* var. *eurycephala* in common. *T. fenestrata* was abundant only at the surface, while *Eunotia flexuosa* var. *flexuosa* was abundant only at one m. The smaller, enriched West Pond supported similar periphyton com-

munities at both levels and sites. At least fifty-five % of each community was composed of *T. flocculosa*, *T. fenestrata*, *Achnanthes* spp. and *Fragilaria crotonensis* at all times. In addition, *Stigeoclonium* spp. were common at the dam site. *Achnanthes* spp. dominated the surface samples during much of the year. *T. fenestrata* was more abundant at one m. During winter and spring, the communities of both levels and sites within each pond were most similar.

(188)

The Distribution of Decapod Crustacean Larvae Within a Brackish Marsh of the Northern Gulf of Mexico

LINDA P. SHIPP

Dauphin Island Sea Lab and
University of Alabama

Decapod larvae from a small coastal river of southwest Alabama were sampled by surface and bottom plankton tows over a twelve month period (Dec. 1974-Nov. 1975). More intensive sampling was conducted at a single station during August, 1976. Temperature, salinity and dissolved oxygen were recorded at every collecting period. More than 80,000 larvae representing 12 genera were sorted, identified and scored. *Uca* spp. were most abundant, composing approximately 86% of the larvae. The data indicated that the salinity gradient played a definite role in the distribution of the larvae. Several species showed a consistent pattern of greater abundance in bottom samples. In addition, progressively older stages followed this pattern. Vertical migration in response to changing light conditions was noted for all species collected in significant numbers during a 24-hr station. A possible response to the low salinities encountered was the paucity of older stages in the collections.

(189)

The Benthic Microfauna of Eight Antarctic Dry Valley Lakes

DANIEL CATHEY, G. M. SIMMONS, WILLIAM YONGUE AND
B. C. PARKER

Only a fraction of the less than 5% of the Antarctic continent which is ice-free consists of so-called dry valley lakes. A study of the benthic Antarctic microfauna inhabiting algal mats in such lakes was undertaken as an integral part of a comprehensive limnological survey of ten dry valley aquatic systems. Four major taxa were found to be present in these lakes: 26 genera of Protozoa, five of Rotatoria, one of Tardigrada and unidentified Nematodes. Of the Protozoa, the Ciliophora dominated with 19 genera. Small particle and bacteria feeders dominated over other feeding types. Major differences were found in the numbers of microfauna present in the lakes. Several of the taxa present were indicative of organically enriched conditions suggesting a highly productive algal mat community as opposed to the relatively oligotrophic nature of the overlying water column.

Population Structure of Pure and Sympatric Rainbow and Brook Trout in Selected Streams of the Great Smoky Mountains National Park

JEFFREY W. SWEENEY AND ERIC L. MORGAN
Tennessee Technological University

and

GARY LARSON
Upland Fields Laboratory, Great Smoky Mountains National Park

The objectives of this study are to evaluate: 1) structural differences in pure rainbow trout populations, pure brook trout populations and a mixed population of the two species; 2) which size classes of fish are in these interacting mixed zones and 3) which size class of rainbow trout is the first to "invade" the brook trout habitat. Presently, 4 creeks have been sampled with backpack A.C. electrofishing units. Preliminary analyses reveal that definite structural differences do exist and that larger rainbows (200+ mm) lead the "invasion" into the headwater brook trout habitat. *Supported by the National Park Service, Southeast Regional Office.*

Response of Benthic Macroinvertebrate Communities to Sodium Hydroxide Neutralization of Acid Receiving Streams

J. A. ARWAY, W. F. PORAK AND E. L. MORGAN
Tennessee Technological University

Road construction has cut through a pyrite containing rock strata, the Anakeesta Formation, and caused considerable damage to the aquatic ecosystems of Citico Creek and Tellico River watersheds in the Cherokee National Forest. Acid leachates combined with an array of heavy metals have been found to be the toxic substances contributing to the elimination of fish and aquatic life. Sodium Hydroxide Neutralization measures and permanent sealing of the road embankments have been undertaken in attempt to control leachate impacts. Physical water quality and benthic macroinvertebrate community parameters were assessed initially and are currently being monitored monthly during accommodation-recovery processes. At alternate months, benthic macroinvertebrate recolonization and recovery rates were evaluated quantitatively by triplicate Surber (ft²) samples and by artificial substrate baskets to assess the effectiveness of the mediation procedures. Kick samples were also taken at each of the 19 sampling sites as a qualitative measure. *Supported by funds provided by the U.S.D.A., Forest Service; U.S. Federal Highway Administration, Region 15 (administered by the Tennessee Department of Transportation) and Aquatic Ecology Fund, Tennessee Technological University.*

The Continuing Effects of an Abandoned Mine on the Ecology of a Small Stream in Southwest Virginia

H. H. SEAGLE, JR., G. H. MOSER AND H. T. CRAVEN
Virginia Polytechnic Institute and State University

In April, 1975, duplicate samples were taken and physiochemical parameters measured, at weekly intervals, at 4 stations along the length of a small stream in southwest Virginia. Macroinvertebrate density, diversity ($\bar{d}$) and number of taxa indicated that Stations 2 and 3 were severely affected by acid mine drainage, and Station 4 was in the zone of partial recovery. Station 1 was located on a tributary to the affected stream and acted as a control. During the study, a 72-hr instream bioassay using indigenous fish and macroinvertebrates was conducted. No mortalities occurred suggesting that chronic rather than acute toxic conditions existed. An important limiting agent to the macroinvertebrates was a ferric hydroxide precipitate that covered the stream bed at Stations 2 and 3. This investigation showed that mine drainage from an abandoned strip mine continued to have an adverse effect on the stream's ecology 25 years after mining operations had ceased.

The Plant Communities of Cape Island, Charleston County, South Carolina

RICHARD STALTER
St. John's University

There are two primary plant communities of Cape Island, the sand dune community and salt marsh community. The sand dune community is the most extensive, covering approximately 60% of the island. Sea oats, *Uniola paniculata*, is the dominant species with 17 other species as associates. The salt marsh community covers approximately 30% of the island and is dominated by *Spartina alterniflora*. The balance of the island consists of freshwater ponds, brackish marshes and a planted *Pinus taeda* forest. The island is very unstable and is characterized by severe erosion, especially on the north and east facing beaches. Because of the redistribution of beach and dune sand, only 35% of the present day island occupies the same geographical area as it did in 1852.

Lygodium palmatum (Bernh.) Swartz (Schizaeaceae), a Heavy Metal Accumulator from North Carolina

DIANE E. WICKLAND
Savannah River Ecology Laboratory and University of North Carolina

In the piedmont of North Carolina, the American climbing fern, *Lygodium palmatum*, occurs predominantly on abandoned mine sites. Studies of the vegetation on lead, zinc and copper contaminated mine sites included heavy metal analysis of plants and soils in

which they were growing. *L. palmatum* was one of the species analyzed for heavy metals by means of atomic absorption spectroscopy. Preliminary analyses indicate that this fern accumulates high concentrations of lead and zinc and moderate concentrations of copper when its substrate is highly contaminated with the same heavy metal. The rhizomes of *L. palmatum* growing on soils at the Silver Hill mine site with 17,000 ppm total lead and 7,000 ppm total zinc accumulated from 1,500-4,500 ppm lead and 1,500 ppm zinc (dry weight basis). On soils with up to 4,000 ppm total copper (Union Copper Mine site), rhizomes had from 150-700 ppm copper. In all cases the fronds of *L. palmatum* accumulated much less heavy metal but did show higher concentrations compared to plants from uncontaminated sites.

(195)

Nutrient Concentrations in Sun and Shade Leaves of Nine Hardwood Tree Species in Southwestern Illinois

J. D. JONES, G. T. WEAVER AND E. L. LEWIS
Southern Illinois University

The relative proportions of mineral nutrients in foliage, for most species and leaf type, are (descending order): $Ca > K > Mg > Mn > Fe > Zn > Cu$. Whether the concentration of a given nutrient was higher in sun or shade leaves depended on species. Differences in concentrations between sun and shade leaves were significant ($p = 0.10$) for only 2 nutrients for *Carya glabra* (Mill.) Sweet (Cu, Zn), *Acer saccharum* Marsh. (Mn, K) and *Liriodendron tulipifera* L. (Fe, K). Differences were significant for concentrations of 6 nutrients for *Fagus grandifolia* Ehrh. (Ca, K, Mg, Mn, Fe, Zn) and *Quercus alba* L. (Ca, K, Mg, Mn, Zn, Cu). Although interactions between species and foliage type were significant for all nutrients except Fe, the principal source of variation in nutrient concentrations was species. Foliage type and the interaction component accounted for less than 9% of the variation in nutrient concentrations for any species.

(196)

The Evaluation of Non-Metric Multidimensional Scaling for the Ordination of Discontinuously Sampled Coenoplanes

MARK D. MACKENZIE AND PHILIP A. ROBERTSON
Southern Illinois University

Non-metric multidimensional scaling with various initial configurations was used to ordinate samples from simulated coenoplanes varying in beta diversity, noise and sampling design. The effectiveness of non-metric multidimensional scaling decreases as beta diversity increases. The method is subject to distortion when the beta diversity is asymmetrical. Distortion in the asymmetrical coenoplanes is reduced when the ordination scores from reciprocal averaging are used as the initial configuration. Non-metric multidimensional scaling is not greatly affected by noise. The method becomes less effective with greater discontinuity in sampling design. For most data sets evaluated in this study, non-metric multidimensional scaling was able to improve ordinations obtained by reciprocal averaging.

(197)

The Woody Vegetation of Little Black Slough, Johnson County, Illinois

PHILIP A. ROBERTSON
Southern Illinois University

Little Black Slough, a 1200 ha backwater floodplain-swamp complex, is being studied using gradient analysis techniques. The woody vegetation, based on 210 plot samples, is comprised of relatively undisturbed mesic, floodplain and swamp forests. Mesic forests are dominated by *Liquidambar styraciflua*, *Quercus rubra*, *Acer saccharum* and *Carya cordiformis* and support an average area of 29 m²/ha. Floodplain forests are dominated by *Acer rubrum*, *Quercus lyrata* and *Fraxinus pennsylvanica* with an average basal area of 33 m²/ha. Swamps are dominated by *Nyssa aquatica* and *Taxodium distichum* and support an average basal area of 65 m²/ha. The major vegetation types in Little Black Slough are similar in composition and structure to other old-growth floodplain forest near the northern limits of the Southern Floodplain forest.

(198)

Leaf Water Relationships of *Nyssa aquatica* as Affected by Simulated Thermal Effluents

N. E. HERR AND K. W. MCLEOD
*University of California and
Savannah River Ecology Laboratory*

On the Savannah River Plant, the impact of thermal effluents has killed many trees in the bottomland forests. To separate possible causative factors, a factorial experiment using temperature and water level gradients was used to examine leaf water relationships. These relationships were examined due to their importance in plant metabolism and transpiration, which ultimately affect survival. Results indicate that there is no effect from increasing the water level except at higher temperatures. At these higher temperatures the higher water levels cause a temporally graded response. This effect at higher temperatures is probably due to a secondary temperature gradient created by the different water levels. Of the temperature treatments used, only 42 and 50 C caused changes in leaf water relationships. As the temperature increased, the response time of the plants decreased. Thus water tupelo is most strongly affected by temperature and affected by increased water levels only when these represent a secondary temperature gradient.

(199)

Flora and Vegetation of Remnant Forests of the Ohio River Floodplain Between the Great Kanawha and Big Sandy Rivers, West Virginia

JOHN C. FURRY AND DAN K. EVANS
Marshall University

Six forest types supporting 146 species of vascular plants were identified in the Ohio River floodplain be-

tween the Great Kanawha and Big Sandy Rivers, West Virginia. Only *Acer saccharinum* and *Platanus occidentalis*, representing 0.8% of the total species, were common to all forest types while 105 species (42.7%) were restricted to a single type. Floristic similarity coefficients for six forest types ranged from 0.73 to 0.10 with the Swamp Forest being least related. Species richness could not be related to community age and degree of disturbance in all forest types. Trees, shrubs, seedlings and herbs were quantified by quadrat analysis. Actual basal area of canopy species ranged from 14.6 feet²/acre in the Swamp Forest to 129.7 feet²/acre in the Stream Bank Forest. Woodlands often disturbed by floodwater showed fewer successional trends than those seldom disturbed.

(200)

Population Age Structures of Tree Species Occurring in Four Plant Communities in the Great Dismal Swamp, Virginia

ELIZABETH TRAIN AND FRANK P. DAY, JR.
Old Dominion University

The age structures of four different plant communities (cedar, cypress, maple-gum and mixed hardwood) in the Great Dismal Swamp were examined. The oldest stand was determined to be the cypress site which also had the greatest standing crop biomass of the four sites. Red maple (*Acer rubrum* L.) was found to be an expanding population in the maple-gum, cypress and cedar stands. Bald cypress (*Taxodium distichum* (L.) Richard) and Atlantic white cedar (*Chamaecyparis thuyoides* (L.) BSP) were determined to be declining in numbers in the cypress and cedar stands, respectively. Linear correlations between age and relative cumulative frequency were determined, and the median ecological longevity estimated for each species.

(201)

Long-Term Response of Baldcypress to Thermal Loading

CASEY SHERROD, JR. AND KENNETH W. MCLEOD
Savannah River Ecology Laboratory

Previous germination studies with baldcypress and water tupelo have shown both species to be tolerant of thermal effluents, germinating and establishing themselves in water temperatures up to 42 C. These observations are based largely on short term experiments. At question is the long term response especially in regard to over-wintering. The current 18-month study investigates the response of saplings of baldcypress (*Taxodium distichum*) to thermal effluents. Growth of baldcypress during the first growing season was enhanced by thermal effluents. Leaf senescence was not modified. Due to the elevated temperature, sapling growth in the second season is expected to be more rapid in the thermal areas, but the stored reserves may be less. Effects of thermal effluents on over-wintering and subsequent second season growth are discussed.

(202)

The Ecological Significance of Late-Season Phosphorus Redistribution in *Quercus prinus* L. (Fagaceae) and *Acer saccharum* Marsh. (Aceraceae) in Central Tennessee

WILLIAM G. EICKMEIER
Vanderbilt University

Phosphorus concentrations of *Quercus prinus* L. leaves from a low phosphorus site and *Acer saccharum* Marsh. leaves from an adjacent, high phosphorus site were measured in late summer while the leaves were green and again immediately prior to leaf fall at the peak of leaf senescence during 1977 and 1978. The late-season decline in leaf P for *Q. prinus* averaged 0.57 mg P · g⁻¹ (or 61% of average green leaf P) while the decline for *A. saccharum* averaged 0.31 mg P · g⁻¹ (or 23% of average green leaf P). The differences between absolute and percent P decline for the two species are statistically significant. It is assumed that the observed P decline represents back-translocation of P to the bole. These data suggest that *Q. prinus* and *A. saccharum* have different nutrient conservation mechanisms and that this difference is correlated with patterns of species dominance on sites of varying P concentration in central Tennessee.

(203)

Changes in Nitrogen Concentration in Foliage During Leaf Senescence

NANCY L. OSTMAN AND GEORGE T. WEAVER
Southern Illinois University

Foliage samples were collected from a pure chestnut oak (*Quercus prinus*) stand in southern Illinois at approximately two week intervals from late summer until leaf fall, 1978. Nitrogen concentration in leaf tissue remained relatively stable from mid-August through mid-October and then decreased sharply during the three weeks prior to peak leaf fall. Concentrations averaged 16,500 µg/ml on October 15, and 6,150 µg/ml on November 8. The mean concentration of nitrogen in leaf litter of 5,500 µg/ml was one-third of the original value in the green foliage. Dry weight of leaf litter tended to be less than that of the foliage, indicating that absolute amounts of nitrogen remaining in the litter may be only 25% of the original nitrogen mass in leaf tissue. Leaching losses from the canopy in throughfall were very low and most of the nitrogen loss is attributed to retranslocation.

(204)

Sulfate-Sulfur Inputs in Bulk Precipitation Stemflow and Throughfall as Affected by Forest-Type, pH of Precipitation and Season in Two Upland Illinois Ozark Watersheds

ROBIN G. BROWN AND GEORGE T. WEAVER
Southern Illinois University

The relative concentrations of SO₄-S among sources were stemflow > throughfall > bulk precipitation in all

cases. The concentration in each source varied significantly by season, but not between watersheds, forest-types (oak-hickory and mesophytic) within watersheds or by pH of precipitation. Bulk precipitation was acid ($\text{pH} < 5.6$) during each season except summer. $\text{SO}_4\text{-S}$ concentrations ($\mu\text{g/ml}$) in bulk precipitation were: 0.67 winter, 0.33 spring, 0.39 summer and 0.74 autumn. Concentrations in throughfall were 0.89, 0.50, 1.07 and 1.37. Stemflow concentrations were 3.31, 2.81, 2.79 and 5.34. Removal of $\text{SO}_4\text{-S}$ from vegetation by stemflow was greatest in autumn and by throughfall during summer and autumn.

(205)

The Character of the Forest Vegetation on the Cumberland Plateau in Tennessee

C. ROSS HINKLE AND H. R. DESELM
University of Tennessee

During the summers of 1976 and 1977, vegetation and soil-site variables were measured, with 563 plot samples (1/25 ha) within 52 selected forest stands, on sites representing the major edaphic-topographic units of the Cumberland Plateau. Twenty-four plant community types were determined using a hierarchical agglomerative clustering technique. Trends in diameter distribution curves and the relative importance of overstory dominants in the understory were used to evaluate the successional status of the community types. The Plateau was characterized as mixed oak on the flat to rolling upland with richer oak forests on the slopes of the dissected surface. Mixed mesophytic vegetation was restricted to middle and lower slopes of the dissected Plateau. The general characterization of the Cumberland Plateau as part of the Mixed Mesophytic Forest Region (Braun, 1950) was not supported by the results of this study.

(206)

Chromosome Numbers of Vernoniaeae (Compositae)

SAMUEL B. JONES
University of Georgia

Chromosome numbers are reported for 57 species of Vernoniaeae from North and South America and from Africa. The genera included are *Bothriocline*, *Centratherum*, *Elephantopus*, *Eragrostis*, *Ethulia*, *Gutenbergia*, *Muschleria*, *Triplotaxis* and *Vernonia*. With these additions, chromosome numbers are now known from 16 of the 70 genera of Vernoniaeae. On a world-wide basis, genera with $x = 10$ predominate with the second greatest number having $x = 9$. The Old World Vernoniaeae are dibasic with $x = 9$, or 10, and have polyploids derived from either base number. *Vernonia* in the New World has a base number of $x = 17$ which is assumed to represent ancient polyploids derived by aneuploidy from a base of $x = 9$. Cytologically, this tribe has less known about it than any of the other Compositae, and much remains to be done.

(207)

Stellate and "Stellate" Trichomes and Stellate Vestiture

JAMES W. HARDIN
North Carolina State University

The term *stellate* has been used entirely too broadly to include any branched trichome with radiating, star-like rays, and also as a type of vestiture composed of stellate trichomes. Such broad usage of this term, as well as others, leads to confusion and varied descriptions too inexact for purposes of critical comparisons. A standardized, descriptive terminology is needed which is based upon SEM studies of trichomes *in situ* and which eliminates the ambiguity of dual or triple meanings. The term *stellate* should be limited to a trichome type which has a single set of radiating, slender rays projecting horizontally from a common center. The stellate trichome may be sessile, stipitate, and the rays slightly fused. Other terms should be applied to those trichomes which may have a superficial star-like form with light microscopy. Vestiture types with stellate trichomes should be called stellate-pilose, stellate-tomentulose, etc. but not simply stellate.

(208)

Revision of *Piptocoma* Cass. (Compositae: Vernoniaeae)

MARTHA A. MUIR AND JOHN G. STUTTS
University of Georgia

Piptocoma Cass., tribe Vernoniaeae, is a small, poorly-known, neotropical genus restricted to the West Indies. Up to the present time, it had been considered to have five species and two varieties. The genus has been revised using standard herbarium techniques, pollen analysis and phytogeography to consist of two species: *Piptocoma samanensis* Alain and *P. rufescens* Cass. The latter has two subspecies: *P. rufescens* Cass. ssp. *rufescens*, which is found on Hispaniola, and *P. rufescens* Cass. ssp. *latifolia* Muir and Stutts (comb. nov.), which occurs on Puerto Rico and the Virgin Islands.

(209)

Revision of *Pollalesta* H.B.K. (Compositae: Vernoniaeae)

JOHN G. STUTTS
University of Georgia

Pollalesta H.B.K., a member of the tribe Vernoniaeae, is a small, poorly-known, neotropical genus ranging from Costa Rica in Central America, south in South America to northern Peru and Brazil. It appears to have its center of distribution in Venezuela and Colombia since that is where the greatest number of species occur. The genus was last revised in 1963 at which time 24 poorly defined species were recognized. Inflation of species number is a common occurrence in many tropical genera in the Vernoniaeae. In the current study, the genus was revised using standard herbarium techniques and is now considered to have about 9 species.

(210)

Spore Ornamentation as a Useful Character in Delimiting *Isoetes* Taxa in the Southeastern United States

BRIAN M. BOOM
University of Tennessee

For many years students of the lycopsid genus, *Isoetes*, have sought reliable diagnostic characters with which to delimit the various taxa. The fact that over 40 names have been applied to *Isoetes* taxa in our area, which actually correspond to some 13 legitimate names, attests to the misinterpretation and confusion which has characterized much of *Isoetes* taxonomy. Research over the past decade has suggested that many of the traditionally used morphological character-states are actually environmentally mediated and consequently of little taxonomic value. Thus, workers have once again focused upon some of the most conservative structures available, the microspores and megaspores. The present SEM study emphasized the patterns of spore ornamentation in the Southeastern U.S. *Isoetes* taxa. A key to the genus in this region based upon these spore characters was attempted.

(211)

Floristics of Elbert County, Georgia

NANCY C. COILE
University of Georgia

Located in the Piedmont of northeast Georgia, Elbert County has an area of over 95,000 ha. It is triangular-shaped, bounded on one side by the Broad River and on another by the Savannah River. Elberton, the county seat, is the center of the southern granitic industry, and granitic rocks lie near the surface in many parts of the county. Historically, much of the land has been cleared, abandoned and cleared again to be used for cultivation of cotton and other row crops. Partly because of this land use, river and stream floodplains and bluffs have the greatest species diversity. A floristically interesting, microphysiographic area is the Flatwoods. Phytogeographical implications and habitats will be discussed for *Vernonia acaulis*, *Aesculus octandra*, *Claytonia virginica*, *Symphoricarpos orbiculatus*, *Lithospermum tuberosum* and others.

(212)

Anatomy of *Parasitaxus ustus* (Podocarpaceae)

EVELYN M. WILKINSON
Old Dominion University

Parasitaxus ustus (Viell.) de Laubenfels is a rare gymnosperm endemic to New Caledonia. Leaves are reddish purple when fresh, fleshy and scalelike. Three resin ducts are present in the leaves, and the mesophyll is undifferentiated. The stem can be divided into epidermis, cortex, vascular tissue and pith. In the apical meristem four regions can be identified: the apical initials, central mother cells, rib meristem and peripheral zone.

(213)

LaRue-Pine Hills: Queen of the Shawnee National Forest (Illinois)

ROBERT H. MOHLENBROCK
Southern Illinois University

LaRue-Pine Hills, an officially designated Ecological Area of the Shawnee National Forest, lies in the northwestern corner of Union County, in southwestern Illinois. The richness of the flora and fauna is discussed in this paper. The biological diversity is due, in part, to the habitats which include spring-fed swamps, rich mesophytic woods, limestone cliffs, cherty slopes and hill prairies.

(214)

Correlation of Selected Morphological Characters and Climatic Variables in *Potamogeton nodosus* Poiret (Potamogetonaceae)

L. J. DAVENPORT
University of Alabama

Species of *Potamogeton* have long been noted for marked morphological variability, resulting in much taxonomic confusion. This variability has generally been considered to be an effect of the microenvironment acting on a rather plastic phenotype. In this study, measurements of certain morphological characters of *Potamogeton nodosus* were found to be correlated with climatic factors, especially temperature, across the broad geographic distribution of the species. Possible ecological explanations for these correlations and the adaptive significance of this variability will be discussed.

(215)

The Status of *Aster georgianus* Alexander (Asteraceae)

RONALD L. JONES
Vanderbilt University

A taxonomic study of the section *Patentes* of the genus *Aster* has resulted in new evidence for maintaining *Aster georgianus* Alexander as a distinct species. In recent treatments of the genus *Aster* in the Southeastern United States, this taxon has been considered either as a synonym, or as a variety, of *Aster patens* Aiton. Accumulated evidence now suggests that *A. georgianus* Alexander can be distinguished reliably from *A. patens* Aiton on the basis of growth form, head size, flower color, chromosome number, flowering period and range. Evidence also indicates a complex ancestry for this species, involving polyploidy and hybridization.

(216)

The Hybrid Fern, *Pellaea* × *wrightiana* — A Problem of Establishment

JAMES F. MATTHEWS AND RHONDA K. TEAGUE
University of North Carolina, Charlotte

Pellaea × *wrightiana*, an endangered disjunct in North Carolina, occurs in two distinct populations. In terms of reproduction one population seems to be in a static situation, the other is dynamic and expanding. Comparative studies of spore germination, gametophyte development, sexual reproduction and sporophyte development seem to indicate that lack of spore germination on native soil is the limiting factor in the static population. Results of these studies in species biology will be discussed in reference to endangered and threatened species and their survival.

(217)

A Practical Application of the Polyclave

JON M. STUCKY
North Carolina State University

A polyclave and a traditional diagnostic key have been developed for the identification of seedlings of a number of important weeds of the Southeastern United States. The results of numerous attempts to identify seedlings with the polyclave and the key are summarized and opinions are offered concerning the design, accuracy and apparent efficiency of each of the two taxonomic tools.

(218)

A Karyotypic Study of *Ipomoea* (L.) (Convolvulaceae)

JON M. STUCKY
North Carolina State University

Karyotypes for the following species of *Ipomoea* from North and South Carolina were determined: *I. purpurea*, *I. hederacea*, *I. pes-caprae*, *I. stolonifera*, *I. macrorrhiza*, *I. pandurata*, *I. sagittata*, *I. trichocarpa*, *I. lacunosa*, *I. coccinea* and *I. quamoclit*. In addition, karyotypes for *I. muricata*, *I. trifida* and *I. setosa* from outside the Carolinas were determined. The potential taxonomic value of karyotypic analysis in *Ipomoea* is discussed.

(219)

Habitat Characteristics of a Western Maryland White-tailed Deer (*Odocoileus virginianus*) Winter Concentration Area

J. EDWARD GATES AND DAN M. HARMAN
*Appalachian Environmental Laboratory,
University of Maryland*

A watershed used by white-tailed deer as winter habitat was studied over a two-year period. The area borders Blandy Run Creek in northeastern Garrett County in the Allegheny Plateau region of western Maryland.

Three distinct habitat types were identified based on differences in plant species composition and structure and physiography. The eastern hemlock-sugar maple habitat on the northeast-facing slope was little used by deer, possibly due to deep snow and low quantities of browsable twigs. The sugar maple habitat on the southwest-facing slope received greater use in spite of the lack of dense evergreen cover. Here, deer took advantage of moderate weather to feed on acorns around seeps and loaf in sunny locations. However, the area which functioned as the primary source of shelter and food for the wintering deer herd was bottomland habitat dominated by eastern hemlock. Basal area of eastern hemlock was $15 \text{ m}^2 \cdot \text{ha}^{-1}$, and total basal area was $48 \text{ m}^2 \cdot \text{ha}^{-1}$. Canopy cover of the dominant hemlocks exceeded 50%, and total canopy cover was greater than 70%. Deer responded to the moderating effect of the dense evergreen cover on weather conditions by centering their activities around this habitat type.

(220)

Mammal Utilization of Transmission-line Corridor and Adjacent Habitats

ANTHONY G. LADINO AND J. EDWARD GATES
*Appalachian Environmental Laboratory,
University of Maryland*

Mammalian activity patterns were evaluated within and bordering a 138 kv transmission-line corridor in western Maryland. Two study sites were selected based on differences in corridor vegetation. One site consisted of grasses and forbs while the other contained shrubs and small trees. Using a sand-tracking technique, numbers of crossings per day by individual species in each habitat type were recorded from May through November, 1978. Results indicated significant differences in activity patterns of certain species in the corridor, the corridor-forest edge and the adjacent forest habitats within and between study sites.

(221)

Distribution and Breeding Site Characteristics of the Jefferson Salamander (*Ambystoma jeffersonianum*) in Maryland

EDWARD L. THOMPSON AND J. EDWARD GATES
*Appalachian Environmental Laboratory,
University of Maryland*

One hundred fifteen potential Jefferson salamander breeding sites were surveyed in Maryland during March, April, May and June, 1977, and 1978. Based on sampling for adults, egg masses or larvae, 54 sites were identified in the western counties of Frederick, Washington, Allegany and Garrett. Habitat characteristics were recorded at each site. With the exception of breeding sites found in the abandoned Chesapeake and Ohio Canal, sites were generally isolated, shallow bodies of water ranging from 2 to 60 m in diameter. The bottom substrate was usually mud covered with leaf detritus. A significant number of breeding sites were located in upland situations. Sites typically were surrounded by or located in close proximity to woodlands. Several water quality measurements, including pH, dissolved oxygen and hardness, were also evaluated for their ability to discriminate sites used by Jefferson salamanders.

(222)

Avian Nesting Success Along Transmission-line Corridors in Western Maryland

GREGORY G. CHASKO AND J. EDWARD GATES
*Appalachian Environmental Laboratory,
University of Maryland*

Avian nesting success was evaluated on two study sites within a 138 kv transmission-line corridor in Allegany County, Maryland. One site was an early successional stage composed primarily of grasses and forbs. The other site was a later successional stage composed mainly of shrubs and small trees. Sixty-eight complete nest histories were recorded for 16 species during the 1978 breeding season. Avian use of the grassland corridor was minimal and limited to a few mixed-habitat species. Characteristic grassland birds were absent from this corridor habitat type. Nesting success here was also quite low. However, the shrubland corridor had a greater diversity and density of nesting birds with a much higher nesting success. The results suggest that shrubland corridors constitute more suitable habitat for avian species than grassland corridors.

(223)

Food Caching Behavior of Captive-Reared Red Foxes

DAVID L. JESELNICK AND I. L. BRISBIN, JR.
Savannah River Ecology Laboratory

Two juvenile male red foxes exhibited stereotypic patterns of food caching behavior when moved into a dirt-floored pen from a concrete-floored run in which they had been raised since being removed from their natal den. The dominant animal did not prevent the subordinate fox from unearthing and/or reburying food which it had buried. Of a total of 44 unearthings of buried food items, 56.8% were made by the subordinate fox. Urine marking behavior was not noted in connection with the burying of food and may suggest that this is either learned behavior or simply related to the lack of maturity of the foxes studied.

(224)

Benthic Macrofauna of Mississippi Tidal Marshes

W. D. HUMPHREY AND A. A. DE LA CRUZ
Mississippi State University

Macrobenthic fauna was sampled randomly once a month from December, 1976, to December, 1977, in 3 marsh communities in St. Louis Bay, Mississippi. The marshes studied differed with respect to vegetation cover, inundation time and elevation. Macro-epifauna and in-fauna samples were collected using the plot method. The three communities, i.e., *Juncus roemerianus*, *Spartina patens* and *S. cynosuroides*, shared common taxa of macrobenthos but the average density was significantly lower in *S. cynosuroides* (17.38 m⁻²) than in *J. roemerianus* (57.07 m⁻²) and even less in *S. patens* (2.92 m⁻²). The dominant species in the *J. roemerianus* community

were *Polymesoda caroliniana*, *Modiolus demissus*, *Neritina reclivala*, *Lycastopsis pontica* and *Melampus bidentatus*, while in the *S. cynosuroides* marsh, *M. bidentatus* and *P. caroliniana* were abundant. *M. bidentatus* and *Uca longisignalis* were the only species occurring frequently in the *S. patens* community.

Analysis of diversity indices for *J. roemerianus* and *S. cynosuroides* revealed the following: 1) Diversity Index (H) in *J. roemerianus* was highest in May and November and lowest during January; in the *S. cynosuroides* community it was highest during June and September and lowest during January; 2) Index of Dominance (c) was higher in the *S. cynosuroides* community than in *J. roemerianus* community throughout the year except for June; 3) Species Richness (d) was consistently greater in *J. roemerianus* community except for January and 4) Equitability Index (e) was best during November for both communities.

(225)

Comparisons of Frequency Distributions for Concentrations of Essential and Nonessential Elements in *Micropterus salmoides* (Centrarchidae)

JOHN E. PINDER, III AND JOHN P. GIESY
Savannah River Ecology Laboratory

From data on elemental concentrations in humans, Liebscher and Smith (*Arch. Environ. Health*, 17:881) hypothesized that the frequency distributions for concentrations of essential elements were normal distributions, whereas the concentrations of nonessential elements had lognormal frequency distributions. As stated by Liebscher and Smith, this hypothesis cannot be supported by theoretical considerations, and we have reformulated it as "the frequency distributions of concentrations of essential elements are symmetrical, whereas the frequency distributions for nonessential elements are skewed." We tested this hypothesis by comparing the frequency distributions of the concentrations of Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mn, Na, Pb, Se and Zn in muscle, liver and eggs of female largemouth bass (*Micropterus salmoides*). Because body condition affects elemental concentrations, separate analyses are presented for all individuals and only those individuals in good condition.

(226)

Respiration Responses of Adult *Tenebrio* to Cyclic Temperatures

T. R. BAUMAN AND E. A. CROSS
University of Alabama

Adult mealworms, *Tenebrio*, were acclimated to and respiration rates determined at four different temperature regimes: 1) constant 25 C; 2) cyclic temperature with a daily mean of 25 C, but temperatures deviate evenly for up to 5 C on each side of the mean; 3) cyclic temperature in which the daily mean is 25 C, but about one-half of the day temperature is 2 C above the mean and a short period in which temperatures gradually dropped 5 C below the mean and then returned to the mean and

4) cyclic temperature in which the daily mean is 25 C, but about one-half of the day temperature is 2 C below the mean and a short period in which temperature gradually rose 5 C above the mean and returned to the mean. Results are discussed regarding the use of constant temperature respirometer data for energy budget determinations.

(227)

Strategies for the Protection and Management of Riparian Ecosystems

J. FRANK MCCORMICK
University of Tennessee

Riparian ecosystems are characterized by a high water table because of proximity to aquatic ecosystems or sub-surface drainage. Floodplain and bottomland hardwood forests are the most common riparian ecosystems in the Southeastern United States. These forest wetlands are unsurpassed as wildlife habitat. They provide shelter for over 100 endangered species. They significantly improve water quality, water recharge and soil stabilization and meet a variety of recreational needs. In spite of high intrinsic values, less than 20% of original riparian habitat persists in the Southeast. The remainder is being lost at a rate of 6% per year. Characteristics responsible for high productivity and species diversity cause riparian ecosystems to be extremely desirable for agriculture, especially soy bean production. Dependence upon a high water table places riparian ecosystems in jeopardy because of a variety of competing water use and water diversion activities. Strategies for improved management and protection of riparian ecosystems will be reviewed.

(228)

Highway Mortality of Vertebrates in Eastern Texas

KENNETH T. WILKINS
University of Florida

Stretches of three highways in eastern Texas were periodically surveyed for one year for carcasses of vertebrates killed on the right-of-way by passing vehicles. Of 286 carcasses observed in 1,768 km of highway, 65% were mammals; the balance was equally divided between birds and herptiles. Seasonal distribution of fatalities and the distribution of carcasses by lanes of highway were examined for each class. Correlation of fatalities with traffic volumes indicated that the number of fatalities decreased as traffic volume increased.

(229)

Sea Turtle Nesting at Cape Hatteras and Cape Lookout National Seashores

S. V. SHABICA
Coastal Field Research Laboratory,
National Park Service

Few sea turtles nest in North Carolina. Recent surveys suggest that fewer than 125 loggerhead turtles

(*Caretta caretta*) nested during the 1978 season on North Carolina beaches. Loggerheads are the only species of sea turtles known to nest in North Carolina. It has been suggested that the low numbers of nesting turtles are related to a variety of human activities, a decline in the temperature of the oceanic waters off North Carolina, or to both. During surveys of the beaches of Cape Hatteras, Cape Lookout National Seashores and Pea Island Wildlife Refuge in the summer of 1978, 12, 28 and 7 nests, respectively, were observed. Although different survey methodologies were employed, there are strong correlations between false crawls and permitted off-road vehicle activities and the presence of nests in areas where off-road vehicle use is prohibited. Human activities and oceanographic parameters are discussed relative to the low numbers of nesting loggerheads on North Carolina beaches.

(230)

Ecology of Three Salamander Populations in a Carolina Bay Pond at the Savannah River Plant, South Carolina

JOHN F. SCHALLES
Emory University

Populations of the salamanders, *Siren intermedia*, *Notophthalmus viridescens* and *Ambystoma talpoideum*, have been quantified as part of an ecosystem organic budget for a shallow, 6-ha Carolina Bay pond on the upper coastal plain of South Carolina. Average population biomass, as determined by a cylinder enclosure technique, was 569, 273 and 151 mg dry wt/m² for *Siren*, *Notophthalmus* and *Ambystoma*, respectively. No fish were present in the pond. Salamanders had the greatest standing crop of the various invertebrate and vertebrate groups, implying high turnover rates in the lower trophic levels. *Notophthalmus viridescens* appeared to be a hybrid of two or three subspecies. The mole salamander population was paedogenic with first year larvae undergoing a reproductive cycle before emerging. Spatially, *Siren* was most abundant in the shallower, emergent vegetation zone; *Ambystoma* was common in shallow water but ranged into the deeper water lily zone; and *Notophthalmus* was rather evenly distributed across the different vegetation zones and depths.

(231)

Gametophytes of *Lycopodium flabelliforme* (Fern.) Blanchard (Lycopodiaceae)

JAMES G. BRUCE
University of Georgia

Gametophytes of *Lycopodium flabelliforme* (Fern.) Blanchard are subterranean, mycorrhizal and tuberous. They are carrot-shaped and divided into three distinct regions. A constricted region, the ring meristem, separates the basal tapering portion from the gametangial cap. In the tapering portion mycorrhizal fungi occur in specialized cells near the periphery. The fungi apparently enter and/or exit through rhizoids. The gametangial cap functions primarily in gametangia production. Both antheridia and archegonia occur on the same cap. The antheridia are massive and sunken. The

archegonia are sunken basally but possess elongate necks. No early stages of embryogenesis were observed. However, older stages were abundant. The foot was distinctly lobed. Growth of the gametophyte occurred from the constricted region via generalized intercalary activity. This meristematic activity allowed growth of the tapering portion in length while gradually widening the "carrot." The cap grew only along its margins adjacent to the constricted ring meristem.

(232)

Development of the Endo-parasitic Water Mold, *Catenaria allomycis*, in *Allomyces arbuscula* (Chytridiomycetes: Blastocladales)

ELLIS E. SYKES AND DAVID PORTER
University of Georgia

Catenaria allomycis Couch occurs as an internal parasite of *Allomyces arbuscula* Butler, as well as in certain other members of the Blastocladales. Light and electron microscopic observations reveal that zoosporogenesis in this organism resembles that described for other members of this order. After encystment of the zoospore of *Catenaria* on the host, a germ tube is produced which penetrates the hyphal wall of *Allomyces*. The protoplast is released into the host through this juncture. Rapid development and growth of the parasite occurs with a corresponding deterioration of the cytoplasmic components of the host. Zoospore formation is initiated as early as 17.5 hrs. This process involves septation and enlargement to form zoosporangia, cleavage to form zoospores and the development of a discharge tube which penetrates the host wall to the exterior. Zoospore release occurs through a break at the distal end of the discharge tube and the posteriorly uniflagellate spores swim away.

(233)

The Periphyton of Sloan's Crossing Pond, Mammoth Cave National Park, Kentucky

JUDITH A. ORSER* AND GARY E. DILLARD
Western Kentucky University

Periodic collections were obtained from Sloan's Crossing Pond for one year to analyze, qualitatively and quantitatively, the periphyton community and determine patterns of periodicity. Productivity was lowest during the winter months and highest between July, and September. Peaks for dry and ash-free dry weights were obtained in August with values of 243 and 92 mg/m²/day, respectively. Chlorophyll *a* followed the pattern of dry weight except its peak was obtained in July at 584 mg/m²/day. Diversity was poorest in the winter and summer months and richest in April. The Chlorophyta and Chrysophyta appeared in their greatest numbers during the spring and fall. During the summer and in December, the Cyanophyta dominated the flora. Euglenophyta were highest in frequency in January and November and lowest during the summer. The pond was designated as being mesotrophic because the productivity levels were lower

than those reported for eutrophic systems. *Present Address: Department of Botany, North Carolina State University.

(234)

Observations on the Development of *Woronina pythii* in Two-Member Host/Parasite Culture

DANIEL P. DYLEWSKI AND CHARLES E. MILLER
Ohio University

Woronina pythii Goldie-Smith is a holocarpic, endobiotic, obligate parasite of species of *Pythium*. This fungus causes hypertrophy and destruction of the host hyphae. Zoospores of *W. pythii* encyst on, and the amoeboid protoplasmic contents of the cysts penetrate, host hyphae and develop therein into multinucleate sporangio-genus plasmodia. The plasmodia by means of pseudopodia-like organelles grow into, surround and ingest organelles and cytoplasm of the host. Sporangio-genus plasmodia cleave into multilobed zoosporangia with interconnections among the lobes through which zoospores may swim during emergence. The protoplasm of each lobe of a zoosporangium cleaves into 4-12 biflagellate zoospores which escape via peripherally situated exit papillae. Cystogenus plasmodia, indistinguishable, at first, from sporangio-genus plasmodia, appear as the two-membered host/parasite culture ages. Cystogenus plasmodia cleave into incipient cysts which become thickwalled at maturity. The cysts are aggregated into cystosori. Cystosori may be dried and upon rehydration produce zoospores.

(235)

Inhibition of Algal Growth by U₃O₈ and UO₂

J. HAWKINS, G. L. BUTLER, J. C. O'KELLEY AND T. R. DEASON
University of Alabama

Strains of green and blue-green algae and diatoms isolated from Rocky Creek on Eglin Air Force Base, Florida, and obtained in axenic culture are being tested to determine the level of uranium, as U₃O₈ and UO₂, that is toxic to them. The testing procedure includes an initial growth test in suitable laboratory medium containing an excess of U₃O₈ or UO₂, as compared to medium lacking uranium. If growth inhibition by U₃O₈ or UO₂ is demonstrated, a second test is performed in which growth is measured in a series of media containing concentrations of U₃O₈ or UO₂ ranging from initial saturation to no uranium. Saturation concentrations are being determined by Dr. Wayne C. Hanson, Los Alamos Scientific Laboratory, by delayed neutron activation. Several strains isolated are inhibited by the quantity of U₃O₈ and of UO₂ that will dissolve in laboratory media, but some are not. Studies on uranium uptake are also being conducted. Study supported by a contract with the U.S. Air Force.

(236)

Detection and Identification of *Clostridium perfringens* from the Barren River, Kentucky,
Above and Below a Sewage Disposal Plant

M. V. HANSEN AND L. P. ELLIOTT
Western Kentucky University

This study examined the incidence of *Clostridium perfringens* in an aquatic habitat. Egg yolk-free tryptose sulphide cycloserine agar was used to initially isolate the *C. perfringens* from the river. Selected biochemical tests were used to confirm the isolates as *C. perfringens*. Various physical tests such as pH, water and air temperature, river depth and flow rate, turbidity, rainfall, nitrate, phosphate, iron and dissolved oxygen were performed in an attempt to correlate the physical parameters with the counts of suspected *C. perfringens* colonies on the selective medium. Summer and fall river samplings have shown no correlation between the various parameters tested. The effluent has had consistently higher counts than four other river sites and also tended to have higher average nitrate and phosphate levels.

(237)

Species-Aggregates of *Trichoderma* (Fungi
Imperfecti) from the Palzo Strip Mine,
Williamson County, Illinois

SUE E. TRYBA AND WALTER J. SUNDBERG
Southern Illinois University

Soil fungi are important in strip mine reclamation through their effect on soil formation and plant growth. Previous studies have indicated that *Trichoderma* is a commonly isolated fungus from the strip mine soils. The occurrence and frequency of species-aggregates from stripped and amended, stripped and unamended and unstripped soils were determined employing the soil dilution plate technique. Three species-aggregates were isolated and described: *T. aureoviride*, *T. hamatum* and *T. viride*. Over a five-month period, the number of species-aggregates isolated from the three soil types increased with *T. aureoviride* the most frequently isolated. Based on the data, there appeared to be no definite pattern to the distribution of the species-aggregates in the three soil types. The increase in numbers with each collection trip may be due to seasonal changes rather than changes in soil composition.

(238)

The Genus *Breutelia* (Musci: Bartramiaceae)
in Mexico

DANA GRIFFIN, III
University of Florida

The genus *Breutelia* is frequent in the mountainous parts of Mexico, occurring mainly on wet soils in sunny locations or on downed wood or near the bases of erect trees. There are 7 species reported for the country, 5

of which range widely through Meso- and/or South America. These taxa are: *B. bittoniae*, *B. deflexifolia*, *B. jamaicensis*, *B. subarcuata* and *B. tomentosa*. Two taxa, *B. chrysocoma* var. *major* and *B. intermedia*, are thought of at present as endemic to Mexico. Spores, when available, are useful for distinguishing certain species while seta length and degree of capsule inclination are unreliable as taxonomic characters. Alar cells may be diagnostic for species determination when used alone (*B. jamaicensis*, *B. tomentosa*) or in combination with other vegetative features (*B. brittoniae*, *B. deflexifolia*, *B. subarcuata*). Complicating polymorphism prevents the assigning of some sterile collections to any of the species known from the area.

(239)

Morphological Variation in Three Varieties
of the Diatom Genus *Eunotia* Ehrenberg

ANGELA C. MORROW AND TEMD R. DEASON
University of Alabama

Light microscopy and SEM were used to study three varieties of the diatom genus *Eunotia* Ehrenberg in two populations collected at Eglin Air Force Base. The varieties studied were *E. vanheurckii* var. *intermedia* (Krasske ex Hust.) Patr., *E. carolina* Patr. var. *carolina* and *E. sudetica* Müll. var. *sudetica*. Differences in these varieties as compared to the norm (Patrick, Ruth and Reimer, Charles, *The Diatoms of the United States*, Vol. I, 1966) are noted in order to clarify and define limits of variability for these varieties.

(240)

Quadrat Studies of Hymenophyllaceae
Populations and Their Bryophyte Associates
in the Southern Appalachians

MARIE L. HICKS
Appalachian State University

Three members of the Hymenophyllaceae, *Trichomanes boschianum* Sturm., *T. petersii* A. Gray and *Hymenophyllum tunbridgense* (L.) J. E. Smith, occur in scattered localities in temperate areas of Southeastern United States, disjunct from their usual tropical habitats. The specialized requirements of the southern Appalachian populations, coupled with slow growth and reduced reproduction, have made their existence tenuous. Some of the populations, once in danger of extinction by overzealous collecting earlier in this century, are now facing reduction due to habitat changes associated with succession or man's activities. In an attempt to gain information concerning the status of these ferns, 150 quadrats from locations in North Carolina, Tennessee, South Carolina and Alabama were studied during 1978. The initial findings indicate that the bryophytes intimately associated with these plants are predominantly widespread tolerant species. A small but significant number of Appalachian endemics as well as species with tropical affinities were also found in these associations. The gametophytes of *Trichomanes*, which occur as separate clonal populations, generally had different associates than the sporophytes, a manifestation of their slightly different ecological tolerances.

(241)

Notes on the Sporocarps
of *Azolla caroliniana* Willd.

VERNON M. BATES, JR. AND EDWARD T. BROWNE, JR.
Memphis State University

Azolla caroliniana Willd. is a heterosporous fern found throughout the Southeastern United States. It is the only fern known to live symbiotically with blue-green algae. This particular blue-green alga, *Anabaena variabilis*, supplies the fern with large amounts of fixed nitrogen. High amounts of nitrogen may account for rapid vegetative growth of the fern, while also retarding the reproductive growth of the fern. The microsporocarps usually occur in pairs or with a single megasporocarp. The microsporocarp contains generally eight to sixty-six microsporangia each. Each microsporangium contains three or four massulae with glochidia both septate and non-septate. The megasporocarps usually occur in pairs or with a single microsporocarp. The single megasporangium contains one mature megaspore with the others aborting to form the floats. The masses of hair on the perispore function in entangling the glochidia of the massulae.

(242)

A Chemical Approach to the Taxonomy
and Phylogeny of the Marchantiaceae

E. O. CAMPBELL
Massey University, New Zealand

K. R. MARKHAM, N. A. MOORE AND L. J. PORTER
D.S.I.R., New Zealand

J. W. WALLACE
Western Carolina University

Six of the seven genera and approximately 25% of the species in the Marchantiaceae have been surveyed for flavonoids. Each species studied was found to possess a unique flavonoid pattern. A "scoring system," based on biosynthetic considerations of flavonoid complexity, supports the advanced nature of species of *Dumortiera*, *Preissia*, *Marchantia*, *Monosolenium* and *Wiesnerella* and the primitive status of *Neohodgsonia*. The data indicate that *Monosolenium*, *Dumortiera* and *Wiesnerella* are only remotely related to the other genera studied and support the re-inclusion of *Conocephalum* and *Lunularia* into the Marchantiaceae. With the exception of *Corsinia*, the consistent presence of the rarely encountered flavone-O-glucuronides appears to be a unifying feature of all genera presently classified in the Marchantiales.

(243)

Studies on CO₂ Limitation and Growth of Algae
in Batch Cultures

BAILEY WARD
University of Mississippi

Algae grown in batch liquid culture progress from an environment rich in nutrients and dissolved CO₂ to one

which becomes nutrient and CO₂ limiting as population density increases. Carbon dioxide demand depends directly upon rate of photosynthesis or population density. Available CO₂ might be affected by several factors; among these are partial pressure of CO₂ in the gas phase, concentration of CO₂ in solution, pH and various diffusion phenomena. As batch culture growth progresses, CO₂ demand increases to a point where it usually becomes limiting. Gassing culture media with 1-5% CO₂ in air has been common practice in the laboratory culture of algae. However, gassing with CO₂ at the beginning of culture of some algae actually decreases growth rate; gassing later, near the point where CO₂ becomes limiting, enhances growth. These and other effects of CO₂ on batch culture of algae will be discussed.

(244)

A Comparison of the Tardigrade Fauna in Pine
and Oak Forests, Bays Mountain Park,
Tennessee

D. R. NELSON, C. HOWARD, C. WILLIAMS AND
G. TUNNELL
East Tennessee State University

Mosses were collected in April, 1978, from two nearby but different habitats in the Bays Mountain Park, Kingsport, Tennessee. Ten samples of *Dicranum scoparium* Hedw. growing on the ground in a pine forest and ten samples of mixed mosses scraped from the base of trees in an oak forest were examined for tardigrades. Fourteen species of tardigrades, representing 8 genera, were found. Ten species representing 6 genera were present in the pine forest; 0-3 species per sample were found. Eight species representing 6 genera were present in the oak forest; 0-7 species per sample were found. Only four species were present in both habitats. The pine forest exhibited greater diversity in terms of total number of species but fewer species per sample and fewer individuals. The most common species were *Hypsibius convergens* and *Macrobiotus intermedius*.

(245)

A Phase and Scanning Electron Microscopic
Study of *Echiniscus viridissimus* (Tardigrada)

DIANE R. NELSON
East Tennessee State University

Echiniscus viridissimus, previously reported only from Romania, was collected from moss growing on concrete-brick posts in Johnson City, Washington County, Tennessee. The habitat is an open dry area, exposed to sunlight, rain and winds near a major road. These dark green tardigrades belong to the "viridis group," which also includes *E. perviridis*, *E. rufoviridis* and *E. viridis*. They are differentiated primarily on the basis of the lengths of cirrus A and the cuticular pigmentation and structure. Identification is based on observations of distinguishing morphological characters with both phase and scanning electron microscopy. Photographs of the cephalic appendages, claws and unique cuticular sculpture are presented.

(246)

A New Genus and Species of Perlidae from The Great Smoky Mountains (Plecoptera)

CHARLES H. NELSON

University of Tennessee, Chattanooga

A description of a new genus and species of the family Perlidae found in The Great Smoky Mountains is presented. A comparative taxonomic analysis with other Nearctic genera in this family was undertaken. Preliminary placement of this new taxon within the tribe Acronuriini was carried out using quantitative phenetic procedures which include the unweighted pair-group method using arithmetic averages (UMPGA) and the weighted pair-group method using arithmetic averages (WMPGA).

(247)

Effects of Some Ecological Factors on a Late Summer Community of Adult Odonata with Special Reference to *Enallagma signatum* (Zygoptera)

JAMES M. CHESHIRE AND PAUL E. LUTZ

University of North Carolina, Greensboro

A community of 15 species of adult Odonata was studied from August until November, 1975, in piedmont North Carolina. Studies were made on behavioral patterns including flight, reproductive and perching activities in relation to ambient temperature, light intensity and time of day. The zygopteran, *Enallagma signatum*, was selected to illustrate the separate and combined effects of these environmental factors on adult behavioral patterns. *E. signatum* initiated flying by mid-day, and it was terminated by 1858 hrs. Individuals initiated flight progressively earlier as natural photoperiods decreased during the study. The relative observed frequencies of reproductive activity ranged from 4-74%. Minimal temperature thresholds for activity ranged from 25 C in August to 16 C in September. Time of day appeared to be the chief controlling factor affecting the behavior of *E. signatum*. In other species, however, behavioral patterns appear to be related to different thermal tolerances and sudden shifts in light intensity.

(248)

Occurrence and Seasonal Distribution of the Butterflies (Papilionoidea) in the Upper Central Basin of Tennessee

TIMOTHY M. GOODEN

Middle Tennessee State University

An investigation was conducted to determine the seasonal distribution of adult butterflies in the Inner Central Basin of Tennessee. Weekly samples were collected at three primary sites from March through November, 1978. Approximately 42 species representing 8 families were identified. The greatest number of species were

in the families Nymphilidae, Pieridae and Papilionidae with other species from the families Lycaenidae, Libytheidae, Danaidae, Satyridae and Heliconiidae. Most of the butterflies of this area exhibited a seasonal distribution with one or more peaks of abundance during the period of observation.

(249)

The Effects of Cadmium and Mercury Upon Survival, Gemmulation and Gemmosclere Morphology in the Freshwater Sponge, *Ephydatia fluviatilis*

MARY MYSING-GUBALA AND MICHAEL A. POIRRIER

University of New Orleans

An investigation into the effects of cadmium and mercury on the freshwater sponge, *Ephydatia fluviatilis*, was conducted. The sponges were exposed to concentrations of cadmium and mercury which ranged from 1.00 to 0.001 ppm for one month. The biological responses exhibited by the specimens resulted in four distinct groups characterized as follows: sponge colony survived and produced gemmules with normal gemmoscleres; sponge colony survived and produced malformed gemmoscleres; sponge colony survived but did not gemmulate; sponge colony died. A direct discriminant function analysis of the four sponge groups, metal concentration and the physico-chemical data established a highly significant correlation between increasing concentrations of cadmium and mercury and increasingly detrimental responses by the sponges.

(250)

Water-mite (Arthropoda: Unionicolidae) Parasites of Amblesminine Fresh-water Mussels (Mollusca: Unionacea) in North America

MALCOLM F. VIDRINE

University of Southwestern Louisiana

In the eastern drainages of the United States (east of the Pacific drainages), *Unionicola tupara* (Mitchell and Wilson, 1965) parasitizes these nominal mussel genera: *Amblesma*, *Megalonaias* and *Plectomerus*. *U. amandita* (Mitchell and Wilson, 1965) parasitizes the nominal mussel genus *Amblesma*. Both of these exobranchial mites have also been sporadically found in the nominal mussel genus *Elliptioideus*. These unique associations suggest that the nominal genera noted above may represent a distinct natural grouping within the Amblesmini *sensu* Davis, Fuller and Hesterman (1977, *Bull. Amer. Malacological Union*, p 85). Other species of less host-specific unionicolids, found parasitizing all major non-margaritiferine unionacean groups in North America, parasitize the above mussel taxa as well: *U. serrata* (Wolcott, 1898) (between the labial palps), *U. aculeata* (Koenike, 1890) (in siphonal mantle and posterior edges of demibranchs) and *Najadicola ingens* (Koenike, 1895) (endobranchial). The author acknowledges the use of mussel lots from the Academy of Natural Sciences of Philadelphia, The Ohio State University Museum and The Delaware Museum of Natural History.

(251)

Notes on *Upogebia operculata*
(Crustacea:Decapoda) from the Northeastern
Gulf of Mexico

D. L. ADKISON, T. S. HOPKINS AND J. K. SHAW
Dauphin Island Sea Lab

Upogebia operculata Schmitt has been rarely collected most likely due to the fact that it lives in hard substrates as opposed to mud or sand flats. The majority of our specimens were collected in pairs from *Madadis decactis* (Lyman) colonies from the Florida Middle Grounds (28° 30' N, 84° 20' W). *U. operculata* was found in mud lined cavities in the dead portions of *Madracis* colonies. Chelipeds are sexually dimorphic; the palm of the propodus of the first leg of the male is more robust, and the fixed finger and dactylus is shorter than their respective counterparts in the female. The distribution of *U. operculata* is now known to be Barbados (type locality), Virgin Islands, Porto Rico, Florida Keys, Dry Tortugas and Florida Middle Grounds.

(252)

Anomalous Sex Traits in Neogastropoda
(Mollusca)

MARTHA G. JENNER AND CHARLES E. JENNER
University of North Carolina

Anomalous sex traits are very common in the Neogastropoda, a dioecious order. Females with a penis have previously been reported in 18 neogastropod species and subspecies, and we have discovered females with male structures in 11 others. We have also noted two previously unrecognized sexual phenomena in the order. We have found males with a female organ, the eggcase-molding foot gland, in 5 neogastropod species; we have seen immatures with secondary sex characters in 12 species. There is no evidence supporting previous hypotheses attributing male attributes in female neogastropods to imposex, protandric hermaphroditism or seasonal changes, but our work on *Ilyanassa obsoleta* has shown that the occurrence of anomalous sex traits in this species is a case of environmentally controlled pseudohermaphroditism. Numerous similarities between the population pattern characterizing anomalous traits in *I. obsoleta* and the patterns in other species suggest that these other Neogastropoda are also environmentally controlled pseudohermaphrodites.

(253)

Rediscovery of *Lagenophrys singularis* Kellicott
(Ciliophora, Peritrichida)

JOHN C. CLAMP
North Carolina State Museum

The loricate peritrich, *Lagenophrys singularis*, has not been reported since its description in 1887. It was found attached to an aquatic vascular plant; other species of

Lagenophrys are ectocommensals of crustaceans. Recently, *L. singularis* was found on leaves of *Ludwigia* sp. and several other species of aquatic vascular plants, freshwater snails and crayfish. In addition, it will settle on glass coverslips suspended in the habitat water. Specimens were taken from numerous localities in North Carolina and one each in Arkansas and Maryland. All collections were made in fresh water in both lentic and lotic habitats. The original description of *L. singularis* is inadequate to establish its identity with respect to other species of *Lagenophrys*. Examination of fresh specimens has revealed two major morphological differences between *L. singularis* and its congeners.

(254)

The Status of the *Apheloria-Rudiloria* Problem
(Diplopoda:Polydesmida)

CHARLES P. WITHROW
Marshall University

The current condition of diplopod systematics is in mass confusion. One of the major points of confusion is the *Apheloria-Rudiloria* problem. *Rudiloria* has earlier been synonymized with *Apheloria* based on secondary characteristics. In looking at the species described as belonging to *Apheloria*, three different types of gonopod configurations can be observed. The first configuration is based on the type species of the genus *Apheloria*. The two remaining groups are what this study is primarily concerned with. These groups are the genus *Rudiloria*, consisting of four species of which two are undescribed, and a yet to be named genus, consisting of two species.

(255)

Notes on Two Species of *Stenorhynchus*
(Brachyura) in the Northern
Gulf of Mexico

GARY D. GOEKE AND THOMAS S. HOPKINS
*University of South Alabama and
Dauphin Island Sea Lab*

Two species of the spider crab genus, *Stenorhynchus* Lamarck, have long been confused under the nominal species name of *S. seticornis* (Herbst). Although larval studies have long indicated the problem, the adult forms have only recently been separated. The established species, *S. seticornis*, is most often found in deeper waters in the Gulf of Mexico (over 70 m) while the newer form is more common in shallow water, frequently on coral reefs and jetties. The species are easily separated by the pubescence characteristic of the new species, the stockier body shape of *S. seticornis* and the difference in the male pleopods. Ecologically, the two species appear close, both having been collected together in the same trawl numerous times. Ovipigerous females, mature males and larvae of *S. seticornis* are typically larger than those of the new form.

(256)

Resistance to Desiccation, Growth Rate and Potential Predators of the Carolina Marsh Clam, *Polymesoda caroliniana* (Corbiculidae)

EILEEN M. DUOBINIS
Mississippi State University

COURTNEY T. HACKNEY
University of Southwestern Louisiana

The resistance of the Carolina marsh clam (*Polymesoda caroliniana*) to aerial desiccation was tested in the field and in the laboratory. Adults (23-55 mm) were maintained dry in the laboratory under simulated marsh conditions. Fifty percent of the clams survived nine days without water in the first experiment using freshly collected clams. Three of the original 42 clams survived 30 days without water. A second experiment using clams that had been maintained in the laboratory for three months produced similar results except that more of the clams died earlier in the experiment. Clams smaller than 15 mm could not survive beyond 6 days. Clams in the field experiment were placed in marsh areas tidally flooded 100, 12, 5.8 and 3.2% of the time. After an initial die-off during the adjustment period, the mortality rate was low at all stations. The average growth rate/year for these clams was greater in the totally inundated area, 2.3 mm/year.

Potential marsh predators were examined under laboratory conditions to determine if they could eat *P. caroliniana* in various size classes. *Callinectes sapidus*, *Uca longisignalis* and *Sesarma reticulatum* regularly consumed clams smaller than 15 mm. As *P. caroliniana* reach 15 mm, their color changes from white to brown and their shell thickens. Apparently this species is subject to both desiccation stress and predation in their juvenile (less than 15 mm) stage.

(257)

Growth in the Musk Turtle, *Sternotherus minor*, in a North Florida Spring (Reptilia:Chelonia)

WILLIAM A. COX AND KEN R. MARION
Memphis State University and
University of Alabama, Birmingham

A mark-release-recapture study was conducted at Emerald Springs, Bay County, Florida, from September, 1975, to September, 1977. A total of 316 *Sternotherus minor* were marked and released, and 144 individuals were subsequently recaptured one or more times. Instantaneous relative growth rates were calculated for animals having a growth interval ≥ 9 months (60 ♀♀, 48 ♂♂). Shorter intervals were not considered due to slow absolute growth in this species. Plots of growth rates versus size (carapace length and weight) revealed that variation in individual growth rates were large (characteristic of both sexes) and that there was a period prior to the attainment of sexual maturity during which growth rates remained relatively stable (most pronounced in ♀♀). Indirect evidence indicates that growth rates declined during the winter months, even though water temperatures remained relatively constant and food was abundant. This suggests the possibility of an endogenous growth cycle or one mediated by factors other than water temperature and available food resources.

(258)

Population Structure and Survivorship in the Musk Turtle, *Sternotherus minor*, in a North Florida Spring (Reptilia:Chelonia)

WILLIAM A. COX AND KEN R. MARION
Memphis State University and
University of Alabama, Birmingham

Population numbers, size class frequency distributions and general survivorship characteristics were estimated for a spring-dwelling population of *Sternotherus minor*. Data for these estimates were obtained during a mark-release-recapture study conducted at Emerald Springs, Bay County, Florida, from September, 1975, to September, 1977. Estimates of population size and frequency distributions within size classes were derived in part by Lincoln Index and in part by incorporating data concerning: 1) mean annual reproductive effort, 2) numbers of mature ♀♀ present, 3) percent infertility of laboratory-reared clutches and 4) observed rates of predation on nests. An estimated 1,730 turtles inhabited the spring pool of which 1,360 (78.6%) were < 60 mm in carapace length. The approximate surface area of the pool bottom was 6,000 m², providing an average of 3.5 m² of habitat per turtle. A general survivorship curve extrapolated from population data indicates that at least 50% of hatchlings die within the first 1½-2 years of life. Less than 31% of ♂♂ and $< 12\%$ of ♀♀ survive to maturity (the discrepancy is due to smaller size at maturity for ♂♂).

(259)

Procedural Inconsistencies in the Histological Examination of Reptilian Bone

CAROL S. SMITH AND G. G. MURPHY
Middle Tennessee State University

Thin section preparations of selected skeletal elements of reptiles exhibit a laminar pattern resulting from seasonal growth activity and endogenous physiological processes. The relationship of the laminar pattern to annual growth cycles has been the object of numerous investigations. The present study concerned the laminar pattern and its correlation with chronological age in *Chelydra serpentina serpentina*. The laminar pattern is superimposed upon a pattern produced by cortical remodeling. Laminar bone patterns are only visible with ground bone preparation while cortical remodeling changes become visible following decalcification. Proper procedures should be maintained if comparative studies are to be conducted.

(260)

Community Structure of a Dry Season Bolivian Amphibian Fauna

P. E. WYLIE W. D. WEBSTER AND C. M. FUGLER
University of North Carolina, Wilmington

The reproductive strategies, spatial distribution and relative abundance of the amphibian species observed in a lowland study area of the northern Bolivian Yungas are discussed. The area investigated contained three

primary aquatic habitats. The reproductively active species include two hyliids, one bufonid and three leptodactylids. Although conspecific with northern equatorial populations, morphometric divergences are noted.

(261)

Age-Specific Growth in Populations of the Slimy Salamander, *Plethodon glutinosus*, from Maryland and Pennsylvania

RAYMOND D. SEMLITSCH
Savannah River Ecology Laboratory

Populations of *Plethodon glutinosus* were monitored from May, 1977, to May, 1978, on five 50 by 50 m (2,500 m²) study sites at Cunningham Falls State Park, Maryland, and Centerville, Pennsylvania. Over 1,100 salamanders were individually toe-clipped with recaptures ranging from 5-30% through the year. From size frequency distributions, using a graphical technique (Harding, 1949, *J. Marine Biol. Ass., U.K.*, 28: 141-153), age-size classes were determined. Age-specific growth was then calculated from SVL's of recaptured individuals. Growth over the summer months was from 2.3 mm/month for 2-year olds to 0.66 mm/month for 5-year olds. Some individuals showed no growth while others showed negative growth over the winter months.

(262)

Aquatic Movements of Farm Pond Populations of the Eastern Mud Turtle, *Kinosternon subrubrum subrubrum*, in East-central Alabama

A. FLOYD SCOTT AND JAMES L. DOBIE
Austin Peay State University and Auburn University

Aquatic movements of mud turtles in two farm ponds near Auburn, Alabama, were studied from April, 1972, through March, 1974. Individuals were captured in wire funnel traps baited with freshly killed fish. Shell notches were used to mark the 240 turtles encountered. Aquatic activity began each year in March at water temperatures of about 18C. It ended the first year in early November and the second year in early December, both times at a water temperature of 16C. The durations of the aquatic activity periods for the two years were 225 and 268 days, respectively. A one-month check of diel rhythm during October, 1973, revealed no significant difference between the amount of daytime and nighttime activity. Definite aquatic ranges were being maintained by individuals of both sexes and all size classes encountered. Invariably these took the form of a narrow strip of shallow water habitat situated adjacent to each pond's shoreline. The average length of all the aquatic ranges studied was 83.4 m; for males this value was 86.1 m, for females 83.5 m and for unsexable juveniles 50.0 m. Turtles in the pond with significantly more emergent and floating leaved vegetation had lower mean aquatic range lengths (71.3 m vs. 90.6 m).

(263)

The Eastern Cottonmouth at the Northern Edge of its Range: Morphometrics

CHARLES R. BLEM AND W. H. N. GUTZKE
Virginia Commonwealth University

The northernmost population of the Eastern Cottonmouth, *Agkistrodon piscivorus*, occurs near Hopewell, Virginia, in the area of the confluence of the James and Appomattox Rivers. Analyses of 268 specimens, including 193 from the Hopewell site, indicate that individuals from the northern population average larger in snout-vent length than those collected in southeastern Virginia or northeastern North Carolina. Variation in size is less at the northern extreme. Few individuals less than 500 mm snout-vent length were collected at the edge of the range even though females held in the laboratory often gave birth to normal numbers of healthy offspring of appropriate size. Meristic characters of the northernmost population vary only slightly from those of the main range, but melanism appears to increase southward. The Hopewell population seems to be an isolated colony left behind during a general southward retreat of the species rather than a range extension during modern times.

(264)

Thermoregulatory Aspects of Temporal Resource Partitioning in the Lizard, *Sceloporus jarrovi*

GEORGE A. MIDDENDORF AND CAROL A. SIMON
University of Tennessee and American Museum of Natural History

Intraspecific temporal partitioning by *Sceloporus jarrovi* results from differences in thermoregulatory ability. Body temperature differences between juveniles and adults were found to be significant only in the afternoon. Both juveniles and adults increased the amount of time spent in the shade as the day progressed. Adults were found to cool more slowly than juveniles and generally were not active in the afternoon. Most other species showing intraspecific thermoregulatory differences also show differences in macrohabitat preferences; *S. jarrovi* does not.

(265)

Growth Rates of Some Visceral Organs in Six Species of Salamanders

J. L. ROBERTSON, D. I. PAV AND JING-MAY CHEN
East Tennessee State University

Normal adult salamanders of six different species are examined. The snout-vent length growth rate is correlated to the weight growth rates of the liver, pancreas, spleen and the cleaned digestive tract. Standard regression biometry indicates high correlation of the growth rates in three of the species (*Desmognathus quadrimaculatus*, *D. fuscus* and *Eurycea bislineata*) and low correlation in the other three species (*Leurognathus marmoratus*, *Desmognathus monticola* and *Plethodon*

glutinosus). The habitat preference of a species (aquatic or terrestrial) is shown to have no correlation to the rate of growth of its internal organs.

(266)

Life History Aspects of the Dwarf Salamander,
Eurycea quadridigitata (Amphibia; Urodela)

MICHAEL McMILLAN

Savannah River Ecology Laboratory

Selected aspects of the life history of the dwarf salamander (*Eurycea quadridigitata*) were examined on the Savannah River Plant in Barnwell County, South Carolina. More than 150 individuals were captured from late summer through winter in drift fence traps associated with two Carolina bays, Rainbow Bay and Ellenton Bay. Subsamples from each site were measured, weighed and dissected to establish reproductive condition, clutch size and diet. Total egg counts in females from Rainbow Bay ranged from 24 to 48 and for females from Ellenton Bay from 15 to 42. A positive relationship between body size and egg number were revealed. Primary food items were springtails, mites and spiders, but several other invertebrate representatives were also revealed. Movement patterns, as revealed by the fall drift fence captures, indicate that most animals move toward the bays in the fall, possibly seeking wetter soil for deposition of eggs. The life history characteristics of salamanders from Ellenton Bay are compared with those from Rainbow Bay.

(267)

Terrestrial Orientation and Directional Fidelity
of Turtles (Reptilia; Chelonia)

G. H. KEATON, J. L. GREENE AND J. W. GIBBONS

Savannah River Ecology Laboratory

Drift fences and pitfall traps have been in use on the Savannah River Plant in South Carolina for 10 years. During this period more than 3,000 turtles have been captured and recaptured as hatchlings, juveniles or adults. Purposes of terrestrial activity were for egg-laying, initial immigration to aquatic habitats by hatchlings, hibernation or unexplained movements. Multiple captures of individuals reveal that some consistently leave and enter the water at the same point. The phenomenon is examined in detail and analyzed to establish whether the particular point of emergence and entry to aquatic areas by an individual is random or a consequence of choice.

(268)

Terrestrial Movement Patterns of Aquatic
Turtles Between Neighboring Bodies of Water
(Reptilia; Chelonia)

M. K. NUNGESSER

Savannah River Ecology Laboratory

Terrestrial movement patterns of aquatic turtles have been examined with the use of drift fences and pitfall

traps on the Savannah River Plant since 1968. Trapping efforts in aquatic habitats in the vicinity of Ellenton Bay, the major collecting site, have revealed that some individuals have moved as far as 1.5 km away. The present study examines the differential dispersal of the species, sexes and age classes to these outlying areas.

(269)

A Preliminary Report on a Herpetological
Survey of the Fall Line Hills Sandhills
of Western Georgia

CHARLES W. SEYLE, JR. AND STANLEY E. TRAUTH

Auburn University

Cretaceous sands of the Tuscaloosa formation in the Fall Line Hills of western Georgia support isolates of the dwarf oak forest community. These communities are characterized by stands of turkey oak and longleaf pine and occupy a considerable portion of Marion, Taylor and Talbot Counties, Georgia. Resident reptiles and amphibians include *Gopherus polyphemus*, *Crotalus adamanteus*, *Pituophis melanoleucas mugitus* and *Rana areolata*, each of which is regarded as potentially threatened or endangered in Georgia. Species composition within various habitats is being investigated using trap arrays composing drift fences and pitfall and funnel traps. An attempt is being made to assess the effect of habitat alteration on populations of potentially threatened or endangered reptiles and amphibians in the study area.

(270)

Comparison of Brain Growth in *Desmognathus welteri* with Selected Plethodontid Species
(Plethodontidae, Urodela)

R. J. COWIE, D. I. PAV AND JING-MAY CHEN

East Tennessee State University

The growth of the brain of plethodontid urodeles as it relates to habitat preference has not been extensively studied. Micro-dissection and measurement of brain length (BL) and weight (BW) as related to both snout-vent-length (SVL) and eviscerated body weight (EBW) was carried out for 24 sexually mature specimens of *Desmognathus welteri* (Barbour). The slopes of the regressions obtained were compared against previously presented and published work on *D. quadramaculatus*, *D. monticola*, *D. fuscus*, *D. ochraphaeus* (Pav and Cowie, 1978) and *Eurycea bislineata* (Pav and Kalla, 1978). These species share many morphological, reproductive and ecological characteristics. While previous study showed general correlation of increased rate of brain growth with increasing use of terrestrial habitats, the rate of both linear brain growth and brain weight for *D. welteri* was significantly greater ($P > 0.05$) than for other semi-aquatic forms. However, relative growth of the three primary brain vesicles as well as sexually dimorphic growth characteristics underscored the conservative nature of brain development in this species.

(271)

Life History and Ecology of *Baetisca bajkovi*
Neave in Beech Fork of Twelvepole Creek,
Wayne County, West Virginia
(Ephemeroptera)

DWIGHT L. CHAFFEE AND DONALD C. TARTER
Marshall University

A study of the life history and ecology of the mayfly, *Baetisca bajkovi* Neave, in Beech Fork of Twelvepole Creek, Wayne County, West Virginia, was conducted from June, 1976, through May, 1977. Nymphs were found mostly in a substrate of small stones, sand and plant detritus. Length-frequency distributions indicate a one year (univoltine) life cycle and head width variations show a female size superiority. The nymphs attained their greatest growth rate (80.0%) from July to August. The nymphs of *B. bajkovi* are detritivorous with the diet composed mostly of plant detritus supplemented with numerous diatoms (mainly *Navicula* spp.). The Chi-square test was applied to 163 male and 179 female nymphs and no significant departure from the 1:1 sex ratio (0.05 confidence level) was found. In the laboratory subimagos emerged from May 2 to May 26 with the imagoes emerging 13 to 25 hrs later. Direct egg counts ranged from 1,508 to 3,158 per female with 2,361 the average. The regression of fecundity on body length was $Y = -5777.2 + 876.9X$, where Y = the number of eggs and X = body length. There was a high coefficient of correlation ($r=0.93$) for this relationship.

(272)

Effects of Stripmining Erosion
on Benthic Insects

VIRGINIA R. TOLBERT AND GERALD L. VAUGHAN
University of Tennessee

Four streams in the New River Basin of East Tennessee have been studied for several years to determine the consequences of coal stripmining on benthic insect communities. Surber samples were taken monthly to determine community composition in both disturbed and undisturbed streams, and physical and chemical analyses were performed to determine differences among streams. Both field and laboratory experiments were performed to determine individual species responses to increased stream velocity during periods of rainfall runoff and to increased siltation. Results showed that most species studied were tolerant of velocities not exceeding 120 cm/sec although species not adapted for clinging to the substrate were found to drift at much lower velocities. Bottom dwelling species were found to exhibit negative responses to accumulations of silt on the substrate. Increased stream velocity and siltation were found to be the primary factors responsible for changes in benthic insect community structure in streams disturbed by stripmining. Supported by a Department of Energy grant.

(273)

Reevaluation of the Asiatic Clam Population
in the Altamaha River, Georgia

JAMES B. SICKEL
Murray State University

Between 1970 and June, 1974, the *Corbicula* population in the Altamaha River underwent exponential growth reaching a density of 468/m² and a tissue dry weight biomass of 23.9 g/m². Since then a decline in density and biomass have been noted. In June, 1978, the density was 192/m² and biomass 14.4 g/m². The average clam weight in 1974 was 51 mg, and in 1978 it was 75 mg. Explanations for the population decline are being sought.

(274)

The Effects of Organotin Antifoulants
on the Environment

DEE S. DUNDEE
University of New Orleans

The use of organotins as antifoulants in paints and coatings is becoming increasingly common. Little is known of their effects on the environment. Bioassays have been undertaken wherein various invertebrates and vertebrates are experimentally subjected to varying concentrations of organotins in various forms. The results reveal that the tins in solution are highly toxic to both groups.

(275)

Usefulness of Nontaxonomic Structure
of Periphyton to Assess Effects
of a Simulated Refinery Effluent

ROBERT A. HONIG AND ARTHUR L. BUIKEMA, JR.
Virginia Polytechnic Institute and State University

Two-week tests of the effects of a synthetic refinery effluent were conducted on periphyton communities on glass slides in artificial laboratory streams. Effluent concentrations ranged from 0.1 to 5 times full strength; the higher concentrations simulated abnormally high discharge conditions. Example mean values (standard deviation) of the nontaxonomic parameters used, for one undosed test, were: 3.751(0.989) and 0.645(0.141) grams/m² dry weight; 1.958(0.564) and 0.422(0.099) grams/m² ash-free dry weight; 41.3(14.1) and 13.8(3.4) mg/m² chlorophyll; 4.861(2.262) and 1.060(0.351) mg/m² ATP (for precolonized and colonizing slides respectively). No statistically conclusive differences resulted between dosed and undosed streams. However, at concentrations of 0.25 times full strength effluent and greater, dosed streams were dominated by green algae while undosed streams were dominated by diatoms. This resulted in higher pH values in undosed streams. These results indicate that in some situations nontaxonomic structural parameters may not detect pollution effects.

Comparative Biototoxicity of Bromochlorinated and Chlorinated Power Plant Condenser Cooling Waters to Selected Estuarine Organisms

L. H. LIDEN, D. T. BURTON AND S. L. MARGREY
Benedict Estuarine Research Laboratory

L. H. BONGERS
Martin Marietta Corporation

Lethal and sublethal responses of phytoplankton, copepods (*Acartia tonsa*), bivalves (*Crassostrea virginica*, *Rangia cuneata*) and fish (*Leiostomus xanthurus*, *Brevoortia tyrannus*) to bromochlorinated and chlorinated low-salinity estuarine waters were observed during an on-site biototoxicity study on the Potomac River in Maryland. Condenser cooling waters of the power station's two identical 550 MWe units (Unit 1-bromochlorinated; Unit 2-chlorinated) were used for long- and short-term flow-through tests during which the biocides were applied continuously at levels of 0.5 mg/l, or less, total residual oxidant (TRO). Post-condenser biocide effects on the respiratory and photosynthetic processes of entrained phytoplankton were evaluated using standard light-dark bottle and ^{14}C -assimilation techniques. Residual biocide concentrations between 0.067-0.120 mg/l (BrCl) and 0.034-0.067 mg/l (Cl_2) significantly increased phytoplankton oxygen consumption levels 1.5 to 15 times that of reference values. Similar TRO levels caused significant decreases in both oxygen evolution (78-255%) and CO_2 -fixation (50-72%) rates for both biocide treatments. No significant difference was observed in survival among *A. tonsa* continuously exposed for 24 h to bromochlorinated (0.020, 0.045, 0.081 mg/l TRO), chlorinated (0.014, 0.045, 0.062 mg/l TRO) or dechlorinated condenser effluents ($T=30^\circ\text{C}$) in flow-through tests. Neither oysters nor *Rangia* showed any differences in survival after 15-day exposures to bromochlorinated (0.020, 0.045, 0.081 mg/l) and chlorinated (0.014, 0.045, 0.062 mg/l) effluents. *Rangia* shell deposition was unaffected by either biocide or control treatments. Shell deposition by *C. virginica* was suppressed equally by both halogenated effluents, relative to controls. Additionally, significantly less shell was deposited among oysters exposed to the highest Cl_2 level (0.062 mg/l) than those at the lowest level (0.014 mg/l). Juvenile spot and Atlantic menhaden showed no significant mortality after 20- and 19-day continuous exposures to the halogenated effluents, respectively. Supported by Ethyl Corporation, Great Lakes Chemical Corporation, Martin Marietta Corporation and Potomac Electric Power Company.

277)

The Effect of Chlorine, Temperature and Exposure Duration on Juvenile Blue Crabs, *Callinectes sapidus*, and Grass Shrimp, *Palaemonetes pugio*

L. W. HALL, JR., S. L. MARGREY, D. T. BURTON AND L. H. LIDEN
Benedict Estuarine Research Laboratory

The effects of interacting chlorine, ΔT and exposure duration as found in various power plants were assessed

for *Palaemonetes pugio* and *Callinectes sapidus*. Test organisms were exposed to total residual chlorine (TRC) concentrations of 0.00, 0.15 and 0.30 mg/l in combination with ΔT 's of 2, 6, and 10 C above ambient temperature. These macroinvertebrates were exposed to the chlorine-temperature test conditions for exposure periods of 0.08, 2.0 and 4.0 h. Chlorine concentrations were decayed over a 2- to 4-h period to <0.01 mg/l TRC. Temperatures were decayed over a 4-h period to 2 C above ambient. These conditions were used to simulate chlorine and temperature conditions encountered in power plant discharge canals and near-field receiving streams.

Regression model techniques were used to establish the interaction of chlorine, ΔT and exposure duration as factors which caused death up to 36 h after the exposure period. Significant mortality occurred for grass shrimp as the concentration of chlorine, ΔT and length of exposure increased. A percent mortality model for grass shrimp shows that: 1) the response to chlorine concentration alone and ΔT alone is proportional to the square root of chlorine concentration and ΔT ; 2) the duration exposure effect is linear and 3) no second order interactions occurred between the variables tested. No significant mortality from any of the variables tested was found for blue crabs. Supported by the Potomac Electric Power Company.

(278)

Combined Effects of Chlorine, Temperature and Exposure Duration on Larval White Perch, *Morone americana* (Gmelin)

S. L. MARGREY, L. W. HALL, JR. AND D. T. BURTON
Benedict Estuarine Research Laboratory

Chlorine-temperature interaction studies with various exposure times were conducted on 25-day old larval *Morone americana* using total residual chlorine (TRC) concentrations of 0.0, 0.15 and 0.30 mg/l TRC in combination with ΔT 's of 2, 6 and 10 C above a base temperature of 18 C. Larval fish were exposed to the chlorine-temperature test conditions for exposure periods of 0.08, 2.0 and 4.0 h. After each respective exposure period, chlorine concentrations were decayed over a 2- to 4-h period to <0.01 mg/l TRC and temperatures were decayed over a 4-h period to 2 C above the base temperature. These test conditions were used to simulate chlorine and temperature conditions encountered in power plant discharge canals and near-field receiving streams.

The interactions of chlorine, ΔT and exposure duration as factors which caused death up to 36 h after the exposure periods were established by regression model techniques. An initial interaction model showed that ΔT was not a factor which contributed to death. A predictive model for chlorine and exposure duration was constructed which showed that potential impact to larval white perch from chlorine at power facilities with once-through cooling systems can be minimized by 1) using short duration exposures to chlorine in plants that chlorinate intermittently or 2) by rapid mixing in the receiving stream in plants that chlorinate on a low level continuous basis. Supported by the Potomac Electric Power Company.

Chlorine, Temperature and Exposure Duration Interactions on Eggs and Prolarvae of the Striped Bass, *Morone saxatilis* (Walbaum)

D. T. BURTON, L. W. HALL, JR. AND S. L. MARGREY
Benedict Estuarine Research Laboratory

Chlorine, temperature and exposure duration interactions were established for eggs and prolarvae of *Morone saxatilis* that may be exposed to various power plant operating conditions. The organisms were exposed to total residual chlorine concentrations up to 0.3 mg/l and ΔT 's to 10 C for exposure durations up to 4 h. After each exposure period, chlorine concentrations were decayed over a 2- to 4-h period to < 0.01 mg/l. Temperatures were decayed over a 4-h period to 2 C above ambient.

A percent mortality model for chlorine, ΔT and exposure duration effects on eggs 36 h after exposure showed that: 1) the response to chlorine alone was much greater than a linear effect; 2) the response to both ΔT and exposure duration alone was less than that of chlorine and 3) two-way linear interactions occurred between chlorine and exposure duration. The percent mortality model for prolarvae 24 h after exposure showed that 1) the response to chlorine alone was less than the linear response to ΔT ; 2) exposure duration alone was greater than a linear effect and 3) two-way interactions occurred between chlorine and ΔT as well as ΔT and exposure duration. Prolarvae were found to be more sensitive than eggs under the same test conditions. Supported by the Potomac Electric Power Company.

A Comparison Between Field and Laboratory Determined Chlorine Avoidance Thresholds for Two Cyprinids, *Notropis galacturus* and *N. spilopterus*

J. D. GIATTINA, S. R. LARRICK, D. S. CHERRY AND J. CAIRNS, JR.

Virginia Polytechnic Institute and State University

The whitetail shiner (*Notropis galacturus*) and spotfin shiner (*N. spilopterus*) were found to avoid sublethal concentrations of total residual chlorine (TRC) in field and laboratory experiments. In the New River thermal effluent from the Glen Lyn Power Plant located in southwestern Virginia, both shiners avoided TRC concentrations ≥ 0.18 mg/l at temperatures from 25-29 C. When discharge temperatures ranged from 30-40 C, TRC threshold avoidance concentrations were lowered, 0.04-0.09 mg/l for the whitetail shiner and 0.12-0.19 mg/l for the spotfin shiner. Laboratory avoidance trials were carried out in a field laboratory located at the power plant. Fish were exposed to successively doubling TRC concentrations from 0.025, 0.05, 0.10 . . . 0.80 mg/l in a steep, horizontal gradient. When tested at 24 C, both species avoided TRC concentrations of 0.20 mg/l. Laboratory determined threshold concentrations approximated the field avoidance thresholds at 24 C but not at higher temperatures (30-34 C). Both species avoided heated discharges ≥ 35 C. The interaction of preference and avoidance responses to thermal effluents with the avoidance to intermittent chlorination is discussed.

Behavioral and Lethal Responses of the Asiatic Clam (*Corbicula fluminea*) to Cu, Zn, Cu-Zn and K Exposures

R. L. GRANEY, D. S. CHERRY, J. H. RODGERS, JR. AND J. CAIRNS, JR.

Virginia Polytechnic Institute and State University and East Tennessee State University

Behavioral responses (gaping, foot immobilization, cessation of siphoning activity), as indicators of stress by the Asiatic clam to several exposures each of Cu, Zn, Cu-Zn combined and K, were evaluated. Comparison were made between the effective concentration that elicited a specific response from 50% of the test organisms (EC-50) and the concentration that caused 50% mortality (LC-50). Static and continuous flow (artificial streams) bioassays were carried out during a 24 to 96 hr period, depending upon the response. The LC-50 was determined by probit analysis while the EC-50 was calculated on a percentage basis. The degree of toxicity of each element, from lowest to highest, respectively, ranged from potassium (no LC-50 from exposures of 20 to 450 mg/l); zinc (LC-50_{96hr} = 6.04 mg/l in static tests); copper-zinc (LC-50_{96hr} = 3.06 mg/l in continuous flow, static LC-50_{96hr} = 0.05 mg/l); to copper (LC-50_{96hr} = 0.49 mg/l in continuous flow, static LC-50_{96hr} = 0.04 mg/l). As heavy metal exposures approached the LC-50, filtering activity declined by approximately 90% while the gaping response was observed in at least 50% of the clams. Foot immobilization was most prevalent in K exposures when an EC-50_{96hr} was observed at 75-100 mg/l. The resistance of the clam to conventional biocidal practices in power plant operations and uses of behavioral responses as stress indicators in providing alternate measures for biofouling control are discussed.

The Effects of Fungal Parasites (Phycomycetes) on Populations of Midges (Chironomidae) in Virginia

W. WALLACE MARTIN

Randolph-Macon College

A number of new and previously undescribed fungi have been found occurring as parasites in the eggs of midges. Quantitative studies over a two year period of midge egg masses collected from over 400 lakes, ponds and streams in 28 Virginia counties have indicated that fungal parasites control the population sizes of certain midge species in large midge communities. During this period, 57% of all midge egg collections were found to harbor some degree of fungal infection. Of all midge egg masses, 26-29% were infected to some degree, and 7-8% of all midge eggs were infected and killed by the fungi. Intensive study of the midge population of one stream has revealed a succession of fungi parasitic in eggs of *Chironomus attenuatus*, the most abundant midge egg mass species present. In a similar pond study, egg masses of *Glyptotendipes lobiferus* and *Endochironomus nigricans* were most abundant and were hosts to a number of fungal parasites. Quantitative studies have provided evidence that high mortality rates in the eggs caused by the fungi effect control of the population sizes

of the *C. attenuatus*, *G. lobiferus* and *E. nigricans* components of the midge communities. Supported by NSF grants GB-42504 and DEB-76-10539.

(283)

Relationships Between the Intragravel Environment and Hatching Success, Emergence and Dry Weight of Salmonid Embryos in the South Mills River Drainage Basin

TOM DECHANT AND JERRY WEST
Western Carolina University

Increases in land usage has resulted in more potential input of sediment in trout streams. It is important that relationships between the intragravel environment and trout embryos be established so potential problems can be defined. The objective of this study was to identify relationships between the intragravel environment and trout eggs and alevins in the Southern Appalachians.

Eyed Brown Trout (*Salmo trutta*) and Rainbow Trout (*S. gairdneri*) eggs were planted in three streams in Pisgah National Forest. Intragravel parameters were monitored through hatching and emergence with Mark VI standpiper. Mortality of eggs varied from 0.4 to 38.4%. Thirteen of sixteen stations had mortalities of less than 8.5%. Emergence varied from 10.3 to 16.6%. Dry weight of emerging fry decreased with time. Intragravel conditions deteriorated with time. Intragravel dissolved oxygen varied from 11.6 to 5.4 mg/l. Permeabilities varied from 175 to 6,000 cm/hr. Apparent velocities varied from 0.5 to 99.0 cm/hr. Correlations indicated that intragravel conditions seem to be adequate for embryo survival; however, a decrease in emergence and dry weight of fry may be attributed to less than optimal intragravel conditions.

(284)

Some Effects of Rechannelization on the Aquatic Organisms in the Coastal Plain Region of the Savannah River

H. L. STIREWALT, M. E. TRUETT, S. M. THIGPEN,
R. G. THOMAS, R. R. HERRING AND B. M. SAUL
Augusta College

During a ten month period, 14 collections were made from 3 selected sites and involved the use of plankton net, substrate cages, Ekman dredge, hoop nets, gill nets and hook and line. Seven plankton samples, four substrate cages, six Ekman dredge samples and seventy-three fish stomachs were examined both qualitatively and quantitatively. Student's t-test was used to analyse the results. Short term stresses were detectable only at the 70% confidence level in three of ten plankton comparisons, only at the 80% level in four of nine macrobenthos comparisons; four of twelve stomach content comparisons were significant at the 80 or 90% level.

(285)

Recolonization of Reactor Cooling Water System by the Asiatic Clam, *Corbicula fluminea*

R. S. HARVEY
Savannah River Laboratory

In 1975 the Asiatic clam, *Corbicula fluminea*, clogged heat exchangers and caused a shutdown of P reactor, one of three operating nuclear production reactors (P, K, and C), at the Savannah River Plant (SRP). The clams were subsequently removed from K and C area cooling systems also. At K Area, large volumes of river water are discharged into three 32-megaliter basins where some settling occurs before the water is pumped through heat exchangers in the reactor area. Deposited silt is suitable substrate for *Corbicula* growth and reproduction and must be removed at regular intervals to prevent heat exchanger pluggage arising from high populations of clams in the basin. The K Area basins were drained in October, 1976, and again in August, 1977. Immediately after draining, the walls and floor were washed, using fire hoses, to remove all clams. This paper presents size/age distribution data for *Corbicula* recolonizing the basins between cleanings. Supported by Contract No. AT(07-2)-1 with the U.S. Department of Energy.

(286)

Ecotypic Differentiation of *Andropogon virginicus* L. (Poaceae) and Strip-Mine Spoil Banks

VALINA K. HURT AND JOE E. WINSTEAD
Western Kentucky University

Reciprocal plantings of populations of broomsedge from an abandoned strip-mine and an abandoned farm plot in south central Kentucky on strip-mine spoil and abandoned field soil resulted in patterns of populational differentiation. Clonal plantings of populations from strip-mine habitats and old field development appeared equal in height and biomass when grown on old field soils in both field trials and growth chamber studies. Populations of strip-mine habitat origin showed greater growth and biomass production compared to old field populations when planted in strip-mine soils in field trials and controlled growth experiments. Indications of later flowering in strip-mine populations may be a key to survival strategy on the harsh microclimates of spoil banks. *Andropogon virginicus* may prove to be an important and economically sound species in reclamation programs, a striking departure from its current status.

(287)

Composition and Diversity in Successional and Stable Forest Communities at Lilley Cornett Woods, Letcher County, Kentucky

MARIANN QUINN AND WILLIAM H. MARTIN
Eastern Kentucky University

On the dissected Cumberland Plateau in Kentucky, cropland abandoned 30-40 years ago often reverts rapidly to forests dominated by tulip poplar. "Pure," successional strands of the species seem to occupy these

sites but supporting composition data and quantitative comparisons with other forests are limited. At Lilley Cornett Woods, young forests have developed an abandoned corn fields in juxtaposition to stable old-growth forest with similar site characteristics. In one field, tulip poplar contributes 23% of the total IV with 28 species in the canopy. While the adjacent old-growth forest is dominated by beech with fewer canopy species, diversity index values are similar for both communities. In addition to shifts in dominance, low floristic similarity and other parameters emphasize distinct stand histories and development. Understory composition of the two communities supports the presumed stability of the old-growth forest and the expected single-generation domination by tulip poplar on the abandoned field.

(288)

Mechanisms of Vegetation and Arthropod Responses to Chronic Wastewater Irrigation

E. J. HUNT AND D. J. SHURE
Emory University

Studies were conducted to determine the effects of four years of nutrient and water subsidies to a South Carolina pine forest. Herb-shrub layer vegetation and arthropod production increased significantly in response to wastewater application throughout the 1976 growing season. A distinct shift occurred from a relatively diverse, perennial-dominated plant community to a less diverse annual/perennial community on spray areas. The few prominent vegetation species in treated areas were segregated temporally and spatially, resulting in lowered community diversity for the growing season. In contrast, the number of important arthropod herbivore species increased from 11 to 23 in treated areas, and herbivores showed less tendency to segregate in time and space. The ratio of plant species having the C3 photosynthetic pathway to those having the C4 pathway was greatly increased in treated areas. Arthropod herbivore populations were thus responding to an increased production of high-quality resources.

(289)

Comparison of Understory and Canopy Species Association Patterns in Mature Piedmont Deciduous Forests

K. DEW, J. N. SKEEN AND H. L. RAGSDALE
Emory University

In an effort to quantitatively describe the degree of association between overstory and understory species within mature deciduous forests of the Georgia Piedmont, composition and distribution patterns of all species in two such forests were determined. Understory species (seedlings, saplings and snrubs > 30 cm high and < 10 cm dbh) and overstory species (woody stems > 10 cm dbh) were sampled at an intensity of 15% employing 0.05 and 0.10 ha circular plots for species of the respective strata. Relative species importance values were determined and clustering/ordination techniques were employed to group similar plots objectively. Patterns of association and their ecological implications will be discussed.

(290)

Observations on Revegetation of Debris Avalanches of the Blue Ridge Mountains

JAMES C. HULL AND RALPH C. SCOTT
Towson State University

The geographic distribution, frequency and revegetation of debris avalanches were examined in the Blue Ridge Mountains of Virginia and North Carolina. Debris avalanches of ages varying from 3 to 40 years were visited. Avalanches resulting from Hurricane Camille (1969) in Nelson County, Virginia, were sampled for revegetation. Recovery following disturbance involves both geomorphological and ecological processes. Debris avalanches create a mosaic of microhabitats which affect the nature and rate of plant succession. Yellow Poplar, Black Locust, Redbud, Black Birch, Red Maple and Tree-of-Heaven were the most important tree species found on the 9 year-old avalanches as measured by importance values. The possible significance of debris avalanches in the geomorphology and ecology of the Blue Ridge is discussed.

(291)

Species Dispersion Patterns Within a Floodplain Hardwood Forest

STEPHEN A. WHIPPLE
Louisiana State University

The dispersion patterns of trees were examined in a hardwood forest located on the flood plain of a small stream in southern Louisiana. Three methods were used: the mean-variance ratio for 10 x 10 m quadrats; the distances from trees to their nearest neighbors and the distances from points to the closest trees. Fifteen tree species with stems equal to or greater than 2.5 cm DBH occurred in the quadrats. Of these, four had sufficient densities to examine their dispersion patterns. *Quercus nigra* was random. *Ulmus americana* and *Celtis laevigata* were clumped but with the stems being uniform within the clumps. The stems of *Carpinus caroliniana* over 10 cm DBH were uniform, but those under 10 cm DBH were clumped.

(292)

Herb Variability in an Old-Growth Bottomland Forest in Southern Illinois

C. C. BAKER, JR., G. T. WEAVER AND P. A. ROBERTSON
Southern Illinois University

A study was conducted in a mesic old-growth bottomland forest to determine the number and size of quadrats required to account for the variability in the herb stratum on mesic sites. Between site variability decreases asymptotically with an increase in quadrat size up to 1 m² for the most abundant species. Within site variability of the two most abundant species becomes constant with the sampling of six quadrats of fixed size (2 m²). In both cases, mean herb cover and mean herb biomass (kg/ha) can be efficiently determined with only 80% accuracy. When analyzing the herbaceous stratum

quantitatively, it may be necessary to state wide confidence intervals to sufficiently encompass variation in the population parameter being estimated.

(293)

The *Pinus strobus* (White Pine) Forest Vegetation
Types of the Great Smoky Mountains
National Park

H. R. DEYOUNG AND H. R. DESELM
University of Tennessee

The white pine-hardwood type was described in 1938; however, subsequent researchers of the vegetation of the Great Smoky Mountains National Park have not dealt further with this type. The objectives of this study were to relocate and plot sample white pine-hardwood strands and to group samples into vegetation types based upon the importance of white pine and its associated tree taxa. Seven types were discerned using an agglomerative clustering technique. Disturbance evidence and historical accounts were analyzed to assess the status of the types. The discreteness of the vegetation types was tested by discriminant and canonical analyses. The sequencing of types suggested that soil moisture was the major factor differentiating the types.

(294)

Aspects of the Biology of *Shortia galacifolia*
(Diapensiaceae)

STEVEN M. JONES AND B. ALLEN DUNN
Clemson University

Shortia galacifolia, an endemic of the mountain region of North and South Carolina, has been proposed as endangered by the U.S. Fish and Wildlife Service. In South Carolina, the species is confined to upper Oconee and Pickens Counties where an estimated 60% of the population has been lost to hydroelectric development. For this species, maximum seed germination was achieved from seed collected five weeks after corolla drop. Germination rates ranged from 48 to 86% with a mean of 65%, which was a significant improvement in germination rate over a previously reported maximum of 9%. Higher germination is attributed to date of collection and no cold storage prior to germination. In addition, early seedling survival and aspects of the phenological life cycle were examined. In light of present and previous investigations, it is recommended that the species be classified as threatened rather than endangered.

(295)

The Role of Allelopathic Interference in the
Maintenance of Southern Appalachian
Heath Balds

ROBERT E. GANT AND EDWARD E. C. CLEBSCH
University of Tennessee

Allelopathy seems to be an important mechanism in the maintenance and persistence of southern Appalachian

heath balds. Comparative analyses were conducted between *Rhododendron catawbiense* and *R. maximum* heath balds in the Balsam Mountains of western North Carolina to distinguish phytotoxic characteristics that enhance persistence. Caffeic acid, gallic acid, gentistic acid, hydroquinone, p-hydroxy-benzoic acid, 2-pinene, phloroglucinol, rhododendrol and vanillic acid were isolated and identified from canopy drip, leaves, litter, roots and soil of the two balds. Bioassays run with aqueous leachates of heath bald litter and soil produced varying degrees of radicle reduction in three test species. Long-term inhibition by heath soils was confirmed in green house experiments. Field studies demonstrated that environmental forces increased the allelopathic effectiveness of heath bald soils on seedling growth and survival. Southern Appalachian heath balds appear more diverse and more involved in the succession of the regional vegetation than has been previously recognized.

(296)

Effects of Time of Perturbation on Community
Reproductive Strategies

MARY E. MACDONALD AND KEN MARION
University of Alabama, Birmingham

Plots in an old field on the Coosa River floodplain in central Alabama were plowed or disced at different times of year and allowed to lie fallow. Nine twenty-sq m communities were monitored at one-month intervals over a period of two growing seasons. The natural plant communities which developed on them were different from each other and dependent on the time of year the plots were disturbed. Measurements were made of individual plants to determine the relative r- and k-ness of the dominant species for each community. The relative r- and k-ness for each of these communities is compared.

(297)

Seed Size as a Correlate of Temporal and
Spatial Patterns of Seed Fall

JAMES F. JACKSON
University of Southwestern Louisiana

Seed fall in a Brazilian subtropical lower montane forest was measured over a year with 120 traps that had a total collecting surface of 174 m². Twenty-two thousand seeds of 227 species were collected. Wind-dispersed species released seeds mainly during the late dry season and early wet season. Among nonwind-dispersed species, large-seeded species matured seeds primarily during the wet season. Small-seeded species were much less seasonal. The difference may stem from a correlation between seed size and mode of animal dispersal. Dispersal success, approximated as the percentage of traps hit by seed, was regressed against several independent variables. For nonwind-dispersed species, the logarithm of seed area best predicted dispersal success, being inversely related to it. Existence of this inverse relationship has often been supposed but only now demonstrated.

(298)

The Reproductive Ecology of *Tipularia discolor* (Orchidaceae)

DENNIS F. WHIGHAM AND MARGARET MCWETHY
Smithsonian Institution

Tipularia discolor is one of the few woodland herbs that displays features of both K and r adapted species. Populations are usually small and maintained by asexual reproduction while fruiting individuals produce numerous seeds. Leaves are absent during the flowering phase and are photosynthetically active from September until May or June. This paper reports data on the reproductive ecology of the species. Breeding experiments show that self-crossing and outcrossing are equally successful. Fertilization seems to be effected by a single species of nocturnal moth whose activities coincide with nectar availability rather than the number of available flowers. Pollinia are carried on the moth's eyes. The percentages of flowers fertilized has been constant over the first two years of the study, and fruit mortality is very low. Seed dispersal patterns will also be discussed.

(298A)

Matrix Models of Succession and Precession

PHILIP H. CROWLEY
University of Kentucky

Several recent papers have attempted to represent (and ultimately to predict) forest succession as a sequence of community state vectors generated by a transition matrix. The matrix is calculated by interpreting the (mortality-weighted) fractional representation of understory species beneath a particular canopy species as the probability that the one replaces the other within an arbitrarily chosen time increment. The **inverse** (when it exists) of the succession transition matrix generates a reverse sequence of state vectors representing **precession** — backwards succession. Despite some mathematical peculiarities, the precession matrix can help interpolate the transition between stands of known successional age: For each stand, both succession and precession transition matrices are calculated, based on a time increment of about one third the age interval between stands; then from each matrix one new state vector is generated to estimate the canopy composition of an intermediate stage.

(299)

Potamogeton Subsection *Perfoliati* in North America

ROBERT R. HAYNES
University of Alabama

Potamogeton subsection **Perfoliati**, a group of submerged aquatic plants in the Potamogetonaceae, has been taxonomically confused. This study attempts to clarify this confusion and presents a distributional and evolutionary history of the taxon in North America. The taxon in North America is recognized to contain two species. Data are primarily morphological and geographical and are based upon: (1) an examination of over 1000 herbarium specimens, (2) field studies in New

England, southeast United States and the Great Lakes region and (3) a study of pertinent literature.

(300)

Vegetation and Flora of Myrtle Island Research Natural Area, Douglas County, Oregon

RALPH L. THOMPSON
Southern Illinois University

Myrtle Island Research Natural Area was established in 1951 to preserve an old-growth stand of *Umbellularia californica* and *Pseudotsuga menziesii*. Myrtle Island, an 11.3 ha island in the Umpqua River Valley of the Coast Range, is the smallest Federal Research Natural Area in the Pacific Northwest. Myrtle Island provides an excellent opportunity for research of a riparian hardwood forest within the Interior Valleys (*Pinus-Quercus-Pseudotsuga*) Zone of western Oregon. Analytic macro-plots were used to obtain data on forest structure, understory vegetation and floristic composition. Based on canopy coverage and frequency of the dominant trees, shrubs and herbs, four forest communities are described. These community types are: *Salix/Spiraea/Equisetum*, *Alnus-Fraxinus/Rubus/Artemisia*, *Quercus/Cytisus-Rhus/Agrostis* and *Umbellularia-Pseudotsuga/Acer/Polystichum*. An annotated list comprises 71 families, 218 genera and 324 specific and infraspecific taxa. Of these taxa, 147 species are introduced aliens. Two Eurasian clovers, *Trifolium angustifolium* and *Arifolium glomeratum*, were documented as distributional records for the Pacific Northwest.

(301)

Reproductive Biology and Pollination Ecology of *Zenobia* (Ericaceae)

LAURENCE J. DORR
University of North Carolina

Zenobia is a shrub endemic to the coastal plain of the Carolinas and southeastern Virginia. The sole species, *Zenobia pulverulenta* (Bart. ex Willd.) Pollard, appears to be weakly self-compatible. Fruit and seed set were reduced by excluding insect flower visitors. Insect visitors were collected and their pollen loads examined for *Zenobia* and foreign pollen. Analysis of these pollen loads and observations of foraging behavior suggest that large hymenopterans, especially *Bombus* spp., are the principal pollinators. Additionally, disintegration tissue, a tissue of unknown function in the connective of the anthers of *Zenobia* and other members of the tribe Andromedeae, was examined for its possible role as a attractant in pollination.

(302)

A Study of Vascular Plants on Rock Outcrops in Southwestern West Virginia

SHEILA K. ZETO AND DAN K. EVANS
Marshall University

A total of 223 species of vascular plants were collected from rock outcrops at five study sites in Cabell, Wayne

and Lincoln Counties, southwestern West Virginia. Eighteen species (8.1%) were present at all five sites with little regard for site conditions while 117 species (52.4%) were restricted to only one of the five sites. Forty-eight species were new additions to the flora of one or more of the counties studied. Trees, shrubs, seedlings and herbs were quantified by quadrat analysis. The most important canopy species were *Quercus alba* (2 sites), *Q. rubra* (2 sites) and *Pinus virginiana* (1 site). The sapling class was dominated by *Acer saccharum* (3 sites) while *Acer rubrum* and *Fraxinus quadrangulata* were dominant species at one site each. Dominant ground cover elements were *Parthenocissus quinquefolia* (3 sites) while *Impatiens pallida* and *Solidago caesia* were dominant herbs at one site each. The outcrops were little disturbed and supported a native flora that was largely habitat specific.

(303)

Notes on the Endangered Georgia Endemic,
Elliottia racemosa Muhl. ex Elliott (Ericaceae)

JOHN R. BOZEMAN AND GEORGE A. ROGERS
Georgia Department of Natural Resources and
Georgia Southern College

Elliottia racemosa Muhl. ex Elliott, a woody monotypic relict taxon of the Ericaceae, was discovered in Georgia by William Bartram (1773-1777). Bartram's specimens were annotated by Asa Gray in 1839, and verified by Joseph Ewan in 1964. Stephen Elliott rediscovered the unnamed plant in Burke County, Georgia, in 1809, and later (1818) described and published the plant as named by Henry Muhlenberg. Nineteenth century records show a population in Aiken County, South Carolina, now presumed extinct. Roland Harper made discoveries in 1901-1903. A few additional discoveries were made during the next 50 years. Discoveries by the authors during the past 15 years have increased plant numbers more than ten-fold. Known populations still number fewer than 20 in 12 counties in Georgia. Seed-set regularly occurs only in the larger populations, suggesting self-incompatibility as proposed by J. K. Small. Plants may grow to a height of 15 m and a diameter of 25 cm without fire, but senescence and death may occur after 40-50 years. Several factors are suggested as contributing to the rareness of the species.

(304)

Pollination Biology of *Ipomoea pandurata*
(L.) G. F. W. Meyer (Convolvulaceae)

ROBERT L. BECKMANN AND J. M. STUCKY
North Carolina State University

Two discrete nectary systems develop in plants of *Ipomoea pandurata*. Nectar secretions of each tissue system serve as insect attractants. Insects visiting the floral nectary function as pollinators. Hymenopteran species attracted to the extrafloral nectaries may protect the plant against herbivorous insects. Although pollinating insects effectively transfer pollen to the stigmatic surface, seed production in *I. pandurata* is extremely infrequent. Barriers to seed formation are considered.

(305)

Flavonoid and Pollen Studies in *Ipomoea*
L. (Convolvulaceae)

ROBERT L. BECKMANN
North Carolina State University

Ten species of *Ipomoea* (*I. coccinea*, *I. hederacea*, *I. lacunosa*, *I. macrorrhiza*, *I. pandurata*, *I. purpurea*, *I. quamoclit*, *I. sagittata*, *I. stolonifera* and *I. trichocarpa*) occur in natural populations in North and South Carolina. These species represent three sections of the genus. Pollen morphology of these species was characterized by SEM techniques. Respective flavonoid constituents were identified by chromatographic and spectral analyses. The taxonomic value of these characters is considered in the context of the current sectional treatment of the genus.

(306)

Taxodium, One Species or Two?

FRANCIS WATSON
North Carolina State University

The genus *Taxodium* is still in a state of taxonomic confusion. Some workers have argued for the existence of only one species, *Taxodium distichum* (L.) Rich., which may include several varieties and/or forms (*T. distichum* var. *distichum*, *T. distichum* var. *mutans* (Ait.) Sweet, *T. distichum* f. *confusum* Palmer & Steyermark) while other have argued for the existence of two distinct species, *T. distichum* (L.) Rich. and *T. ascendens* Brongn., on the basis of overall morphology and habitat differences. Scanning electron microscopy along with other methods is being used in an attempt to resolve this confusion. Preliminary results from these studies will be presented.

(307)

Statistical Analysis of the Flora
of the Carolinas

P. E. BOSTICK
Kennesaw College

The *Manual of the Vascular Flora of the Carolinas* was used to prepare mark-sense sheets for each of the taxa of the Carolinas. Data input to the computer included number of counties in which each taxon occurred, physiographic province distribution, habitat, major taxonomic group, persistence, duration, life cycle, habit, sexual pattern, leaf arrangement, leaf margin, vestiture, blooming phenology, perianth color, chromosome number and endangered status in each state. These data were tabulated to prepare a spectrum for each item and each item was cross matched to the others.

(308)

Indications of Apomixis in Zephyrantheae

G. L. SMITH AND W. S. FLORY

University of Georgia
and

Wake Forest University

Genetic barriers have been frequently crossed at both specific and generic levels in the Amaryllidaceae. In an attempt to further define generic and specific relationships in this family, F_1 progeny of several interspecific and intergeneric crosses in the tribe Zephyrantheae were studied cytologically. Most crosses involved species of *Zephyranthes* and *Hebranthus*. The chromosomal complement for some of these supposedly hybrid progeny were observed to be the same as that of the maternal parent. Because the seed parents in these crosses were carefully emasculated to prevent selfing and the chances of outcrossing were minimal because of greenhouse control, apomixis is indicated to be the explanation for the results. Progeny believed to be apomictic will be presented, and the possible role of apomixis in the evolution of the taxa involved will be discussed.

(309)

Vascular Flora of the Bull Creek Watershed, Osceola County, Florida

ROBIN B. HUCK

University of North Carolina

The collected flora of the Bull Creek Watershed, a pineland area of 26,000 acres in east-central peninsular Florida, contains 466 species representing 105 families. Among the taxa are *Aristida simpliciflora*, a disjunct from the Florida Panhandle, *Rhaphidophyllum hystrix*, a threatened species on the U.S. Endangered and Threatened Plant List and fifteen species reported as endemic to Florida. The species richness of Bull Creek is reflective of the many topographic and edaphic niches present in the pineland. Those endemics seen on dune ridges over quartzipsamment soils include *Conradina grandiflora*, *Lechea divaricata*, *Polygonella fimbriata* var. *robusta*, *Rhynchospora intermedia*, *Stipa avenacioides* and *Tephrosia rugelii*. Those on high pineland over haplaquods are *Asclepias feayi*, *Asimina reticulata*, *Carphephorus carnosus* and *Pilobelphis rigida*. Peripheral to streams and sinks and in savannah-like areas over haplaquods and psammaquents are *Coreopsis leavenworthii*, *Lobelia feayana*, *Polygala rugelii*, *Vitis shuttleworthii* and *Zephyranthes simpsonii*.

(310)

A Preliminary Look at the *Hydrangea arborescens* Complex (Saxifragaceae)

RONALD E. PILATOWSKI

North Carolina State University

Hydrangea arborescens is currently treated as including three subspecies following McClintock's monograph in 1957. These three taxa (subspecies *arborescens*, *discolor* and *radiata*) were distinguished by foliar vestiture, trichome features and presence or absence of sterile

flowers. I have begun a re-examination of the entire species complex using various techniques. Scanning electron microscopy of seeds shows no difference between subspecies. SEM of foliar trichomes and surface features indicates differences in the vestiture, form and frequency of trichome tubercles and patterns of cuticular ridging on the epidermal cells. Further analysis of these features, as well as others, within and between subspecies should indicate the relationships which exist between the members of this complex.

(311)

A Preliminary Survey of the Genus *Zamia* (Cycadaceae) in Florida

GARRIE P. LANDRY

Louisiana State University

Considerable confusion exists over the number of species of *Zamia* (Cycadaceae) in Florida. Four species were recorded in the State by Small; however, recent trends have been to combine these taxa into one species. As a result, an array of names clutters the literature: *Zamia angustifolia*, *Z. floridana*, *Z. integrifolia*, *Z. pumila*, *Z. silvicola* and *Z. umbrosa*. A field study to help clarify the taxonomic relationships within the genus was made. Present evidence indicates that there are 2 morphotypes which exhibit some geographic variation. Occasionally plants with intermediate characteristics were observed.

(312)

The Floral Biology of Witchweed (*Striga asiatica* (L.) Kuntze) (Scrophulariaceae)

DANIEL L. NICKRENT

Old Dominion University

Developmental and greenhouse studies have shown that American witchweed exhibits facultative autogamy. Pollination occurs in a specialized "pouch" region of the corolla tube prior to anthesis. Anthers and stigma are proximal during flower growth due to the simultaneous elongation of the style and corolla tube. The two anterior anthers dehisce first depositing a pollen mass onto the stigma and the retrorse hairs lining the pouch. Styler growth continues towards the two posterior stamens which dehisce as the corolla lobes begin expanding. Pollen is held on the stigma by a mucilaginous secretion. Pollen germination and growth of pollen tubes through the style begin just after the first set of anthers dehisce.

(313)

Observations on *Striga* (Scrophulariaceae) in Nigeria

LYTTON J. MUSSELMAN

Old Dominion University

Striga hermonthica (Del.) Benth. and *S. gesnerioides* (Willd.) Vatke are widespread species of African grasslands and serious parasites of sorghum and cowpeas, respectively. Both exhibit considerable variation in corolla color and morphology. Most flowers are chasmogamous although occasional cleistogamous flowers are produced,

usually underground. *Striga asiatica* (L.) Kuntze (= *S. lutea* Lour.) is also found in Nigeria but is not known to be a pathogen of grain crops unlike the strain accidentally introduced to the Carolinas in the 1950's. Several strains of these species appear to be adapted for specific cultivars of widely planted grains. This adaptation does not seem to be correlated with apparent morphological features. No autogamy was noted for any of these species. Several non-pathogenic taxa of *Striga* in Nigeria are also discussed.

(314)

A Systematic Study of the *Solidago sempervirens* L. Complex (Compositae)

ROGER BOETTCHER
Louisiana State University

Solidago is a worldwide genus of about 100 species with its greatest diversity in temperate North America. The treatment of this genus has often been found to be taxonomically difficult and has resulted in confusion in the literature. The group is composed of many species complexes which may at first appear distinct but upon closer examination are found to intergrade in many respects and even to hybridize. The *S. sempervirens* L. complex is found principally along the Atlantic coast from Canada to Central America rarely ranging inland more than two hundred miles. Some members of the complex are found on Atlantic and Caribbean islands, as well as along the coast of California. This complex has been variously treated in the literature and there are still uncertainties in the delimitation of taxa within the group. The present study is an examination of the *S. sempervirens* L. complex emphasizing scanning electron microscope morphology, chromosome number, chromatography and leaf anatomy. Statistical methods were employed to show correlations of various characteristics in a survey of herbarium specimens. A taxonomic treatment is prepared which is intended to reflect a more thorough understanding of the phylogenetic affinities within this complex.

(315)

Aruncus dioicus (Rosaceae), Foodplant of the Rare Dusky Blue Butterfly, *Celastrina eburnina* (Lycaenidae)

T. LAWRENCE MELLICHAMP
University of North Carolina, Charlotte

Goatsbeard [*Aruncus dioicus* (Walter) Fernald] is a well-known herbaceous perennial found in rich cove hardwoods and along moist, shaded roadcuts in the Southern Appalachians and westward. It was recently discovered to be the larval foodplant of the monophagus Dusky Blue butterfly, *Celastrina eburnina* Clench. Aspects of the life history of the Dusky Blue have been studied, including habitat, phenology, feeding habits and pupation habits with some interesting conclusions regarding its relationship to *Aruncus*. For example, in the laboratory, *Celastrina* fed only on young leaves; in the field, it was observed to feed almost exclusively on flower buds. Pupal development in the lab was apparently abnormal.

(316)

The Vascular Flora and Ecology of the Kennedy Tract, Bulloch County, Georgia

D. J. DRAPALIK, M. W. HOTCHKISS AND JOHN PAFFORD
Georgia Southern College

The Kennedy Tract occupies 75 acres in the Upper Coastal Plain of southeastern Georgia and is located about six miles south of Statesboro. The tract is composed of well-drained to poorly drained flatwoods represented by the following seral cover types: (1) bluejack oak-scrubby post oak-longleaf pine sandhill forest, (2) longleaf pine-slash pine savannah, (3) black gum-red maple, cypress stream border forest, (4) tree and shrub bog and (5) pitcher plant bog. Preliminary soil studies showed that all cover types had soils that were relatively low in N, P, K, Ca and Mg. Soil pH ranged from 4.6 to 5.8, and soil organic matter ranged from 0.7 to 4.9%. To date, approximately 210 species of vascular plants have been observed and collected from the area. From a scientific and aesthetic viewpoint, the tract's diverse pitcher plant (*Sarracenia*) bogs are especially noteworthy, and frequent fires have maintained this cover type. Because of man's activities, pitcher plant bogs are rapidly disappearing from Georgia, and the Kennedy Tract contains one of the largest remaining bog systems in Bulloch County. Efforts are being made to conserve this area for use as a natural laboratory.

(317)

Effect of Thermal Shock on Upper Lethal Temperatures of the Guppy, *Poecilia reticulata* (Poeciliidae)

JOHN A. FREEMAN
Winthrop College

In preliminary studies of the effects of fluctuating temperatures on the guppy, fish acclimated to 30 C for two weeks were compared with others moved between aquaria maintained at 20 and 30 C. In paired samples, the temperature killing 50% of individuals on 10 minutes exposure was determined for both males and females. For both sexes, lethal temperatures of 39.6 C were found for fish constantly maintained at 30 C. Fish subjected to repeated transfers between 20 and 30 C exhibited lethal temperatures of 40.1 to 40.2 C. It appears that the guppy acclimates to thermal shock resulting in a heightened resistance to suddenly elevated temperatures. Resistance times based on week-long observations show corresponding elevations.

(318)

The Response of Decomposer Microarthropods and Their Environment to Secondary Succession on the Georgia Piedmont

DENIS T. DUBAY AND DONALD SHURE
Emory University

Decomposer microarthropods and their microenvironment were studied in 2 old fields and 2 forests representing seral stages of secondary succession on the Georgia

Piedmont. Moisture, litter cover and soil organic matter increased during succession, while soil bulk density and sand content decreased. Microarthropod density and diversity increased with successional age. Peak microarthropod densities generally occurred in the pine stage, and maximum diversity was present in the hardwood forest. The variability of microarthropod density and diversity declined in the forested stages. Principal components analysis showed litter cover and soil richness were important gradients during succession and within each seral stage. Arthropod response to these gradients indicated horizontal and vertical movement towards favorable litter and soil conditions.

(319)

Densities and Trap Related Activity Patterns of the Raccoon, *Procyon lotor* in Western Tennessee

DWIGHT W. MOORE AND MICHAEL L. KENNEDY
Memphis State University

Densities of the raccoon, *Procyon lotor*, were studied on five trapping grids located on the Meeman Biological Field Station and Shelby Wildlife Management Area in Shelby County, Tennessee. From 15 August, 1977, to 21 July, 1978, a total of 61 raccoons were captured. Fifty-eight animals were tagged and released on a combined study area of approximately 130 ha. Densities were estimated to be 1 raccoon/1.7 ha using mark-recapture indices. Trapping success varied seasonally with temperature being the only weather variable which correlated with trap related activity.

(320)

Genetic Differentiation in Three Sympatric Morphs of the Asteroid Genus *Othilia* (= *Echinaster*)

R. D. TUTTLE, RONALD LINDAHL AND THOMAS HOPKINS
University of Alabama

Large amounts of intra- and interspecific morphological variation occur in asteroids. Such variation may be indicative of polymorphism within a species or morphs undergoing speciation. Three sympatric morphs (grey, brown, orange) of the genus *Othilia* inhabit the north-eastern Gulf of Mexico. In order to determine whether these morphs are a single species or diverging species, we examined several enzyme systems, representing 16 loci, for variability by starch gel electrophoresis. The orange and grey morphs differ from one another at 7 of 22 morphological characters examined; the orange and grey morphs each differ from the brown morph at 15 characters. Despite morphological differences, based on these 16 loci, the three morphs have over 90% of their genes in common. The average heterozygosities within the morphs and the genetic distances between the morphs will be presented. These results support the hypothesis that the orange and grey forms are morphs of the same species and the brown form, a diverging species.

(321)

Ecological and Geographical Distribution of the Southeastern Pocket Gopher, *Geomys pinetis*

D. S. LEE AND J. B. FUNDERBURG
North Carolina State Museum

R. FRANZ
Florida State Museum

Between 1965 and 1977 we drove all major roads in Florida, Georgia, Alabama and southeastern South Carolina to document current distribution of *Geomys pinetis* which makes conspicuous soil mounds in burrowing. Information on soil type, mound density and plant communities was recorded. Comparison with historic distribution and fossil records showed a decline in overall range. Habitat loss from development and natural succession has caused extirpation of numerous peripheral populations. Pocket gophers typically require savanna-type, fire-maintained habitats on well drained upland soils. Most colonies are confined to disjunct "sandhills" where long-leaf pine, *Pinus australis*; turkey oak, *Quercus laevis* and wire grass, *Aristida stricta*, dominate. Sand pine, *P. clausa*, scrubs, also provide suitable habitat but most activity is in ecotonal areas. Some populations have expanded into artificial habitats where, if undisturbed, they occasionally develop dense populations.

(322)

Roosting Patterns and Social Rank in Free-Ranging Bantam Chickens

H. CRAIG RAGLAND AND I. LEHR BRISBIN, JR.
Savannah River Ecology Laboratory

The relationship of nighttime roosting pattern to social rank was examined in a flock of feral bantam chickens both before and after their release into a bottomland swamp hardwood forest. Birds of highest social rank were found more often on the highest perch of a three-levelled multi-tiered roost inside a small coop in which the birds were confined prior to release. After the birds were given free access to the out-of-doors, social rank no longer was a significant factor in determining location on the roost, though all birds continued to return and roost within the coop at night. The results suggest that caution should be applied to interpretations of studies of social interaction amongst animals that are artificially housed or otherwise confined to a restricted space.

(323)

The Influence of Heated Effluents on Turtle Populations in Par Pond, South Carolina

JOSEPH P. SCHUBAUER
Savannah River Ecology Laboratory
and
SUNY College, Buffalo

The influence of heated effluents on turtle populations in Par Pond, a thermally altered lake in South Carolina, was determined. Quantitative measures of abundance

and movement were determined for populations inhabiting a thermal area and a control site at ambient water temperatures. A variety of trapping techniques and radiotelemetry were employed. Over 400 turtles were captured and marked in this study. Thirty individuals were followed using radiotelemetry, and 15 to 20 of these turtles were under observation simultaneously during the year.

(324)

Effects of Regional Climatic Extremes on Old-Field Mammal Populations

ALBERT K. LANGLEY, JR.
Emory University

A three year live-trapping study of the cotton rat (*Sigmodon hispidus*) has demonstrated the role extremes of weather may play in the regulation of some small mammal populations. High density cotton rat populations in a broomsedge stage old-field and a fescue pasture suffered declines in numbers during the severe winter of 1977. This trend continued through the dry spring and summer of 1977, and the pasture population declined to extinction. The old-field population remained at very low numbers throughout the dry 1978 growing season. The two years of very dry springs and summers considerably altered the *Sigmodon* microhabitat of both fields. Extremes of weather will thus act as a direct agent of population regulation by causing mortality and as an indirect agent through habitat modification.

(325)

Hair and Its Taxonomic Use for Selected Mammals of Tennessee

J. K. BRAUN, D. W. MOORE AND M. L. KENNEDY
Memphis State University

A key to the species of Soricidae, Vespertilionidae and Cricetidae found within Tennessee was prepared using selective characters of dorsal guard hairs. Hair from the dorsal pelage was obtained from museum specimens. Bright-field light microscopy was used to determine width of the hair and internal structure. Scanning electron microscopy was used to determine surface characteristics of the hair. These characters combined with banding patterns and the general shape of the hair were used in the analysis. It was possible to identify all specimens to genus and in most cases refer specimens to species.

(326)

Cooperative Soaring Strategies in Migrating Falconiformes: Observation from Light Aircraft

DAVID P. ROBSON
Maryland Ornithological Society

During the last three autumns, attempts were made to follow hawks and vultures in light aircraft to observe routes and methods of migratory flight. It is well known that soaring species of Falconiformes use thermals to gain altitude, then glide in the desired direction, losing altitude, until another thermal is encountered. The role

of flocking in this type of flight has remained obscure. Several flocks of Turkey Vultures, *Cathartes aura*, were followed; the longest continuous observation covered 1.3 hours and 19 miles. Cooperative soaring strategies were observed. Vultures circled in tight groups within "dry" thermals, then spread out along a broad front while gliding cross country. Flock dispersion during the glide appeared to maximize the chance of encountering another thermal. The circling behavior of one bird quickly attracted other members of the flock. Factors affecting optimum flock size will be discussed.

(327)

Reproductive Characteristics and Variation in Aquatic Turtles (Reptilia; Chelonia)

J. WHITFIELD GIBBONS AND JUDITH L. GREENE
Savannah River Ecology Laboratory

Our objective was to examine several species of long-lived, late-maturing freshwater turtles in regard to clutch size and related reproductive parameters. The data are based on more than 200 clutches from six species. Many individuals had multiple clutches, both within and between years, so that an unprecedented measure of intra-individual variability was possible. These data permit a more thorough assessment of the reproductive facet of life-history tactics than has previously been possible.

(328)

Isolation and Identification of Yeasts from the Barren River, Kentucky

R. A. VANENK AND L. P. ELLIOTT
Western Kentucky University

Yeast populations have been studied in relation to the effects of ambient temperature, pH, dissolved oxygen, iron, phosphates, nitrates and turbidity concentrations. Samples collected at bimonthly intervals over a complete seasonal cycle from five sites were plated in triplicate on Plate Count Agar (Difco) containing 100 mg/l of chloramphenicol and chloromycetin. After incubation at 25 ± 1 C for seven days, total colony forming units were determined and colonies picked for purification and identification. Results show no correlation between yeast counts and environmental factors up to the winter months and no seasonal fluctuations were noted. The presence of potential yeast pathogens was determined by standard identification techniques. *Supported by a grant from the Kentucky Academy of Science.*

(329)

The Nutritional Requirements of *Leptolegnia* sp. (Oomycetes), a New Species of Mosquito Parasite

WILLIAM C. ZATTAU AND THOMAS MCINNIS, JR.
Clemson University

The nutritional requirements of *Leptolegnia* sp. were examined. Carbohydrate, nitrogen, mineral and vitamin

requirements were examined along with environmental parameters of temperature and pH. The effect of sterol supplements on growth and reproduction were also examined in light of their increasingly acknowledged importance in water mold physiology.

(330)

Indolic Hormones from *Chara zeylanica*

EDNA R. RICHARDSON AND LAWRENCE A. DYCK
Clemson University

Apical portions of *Chara zeylanica* were extracted, purified and subjected to conventional adsorption thin layer chromatography. Acidic fractions of the extract contained a compound which regularly quenched UV₂₅₄ fluorescence in the same R_f zone as did standard IBA, and other compounds which occasionally quenched fluorescence in the regions of standard IAA and IPA. Positive reactions with Erlich's reagent indicated that these compounds were all indolic in nature, and *Avena* coleoptile straight growth bioassays showed significant growth promotion when the compounds which chromatographed with IBA and IAA were applied. Neutral fractions of extract were found to contain three Erlich positive compounds; two of these corresponded with standard Indole-3-acetamide and Indole-3-acetaldehyde, respectively.

(331)

Ultrastructural Development of the Internodal Cells of *Chara australis*

JANE E. LAWRENCE AND LAWRENCE A. DYCK
Clemson University

The progression of ultrastructural changes associated with the growth and development of giant internodal cells from a meristematic apical cell is described from transmission electron microscopic observations. Among the more important topics to be discussed are: (1) the differentiation of streaming endoplasmic and stationary ectoplasmic regions of the cytoplasm; (2) the development, arrangement and interconnections among files of chloroplasts and bundles of microfilaments; (3) the process of cytoplasmic vacuolization; (4) the organization of cortical microtubules and their possible relationship to cell wall enlargement and unique projections from the plasmalemma.

(332)

Antibacterial Activity from Freshwater Chlorophycean Algae

LAJOYCE DEBRO AND BAILEY WARD
University of Mississippi

We have examined twenty-four species of freshwater green algae in attempts to identify those that produce antibacterial substances. Fourteen of our test organisms exhibited significant inhibitory activity against *Staphylococcus aureus* and *Bacillus subtilis* when ethanolic algal

extracts were assayed using a modified cup assay technique. Algae varied widely in the relative degree of inhibition activity and taxonomic relationships; no clear-cut pattern of antibiosis was evident. Algae showing greatest antibacterial activity were selected for further experiments designed to determine both the nature of the inhibitory substance(s) and the conditions of algal culture environment which favored production of active products. The results of these and related experiments will be discussed.

(333)

Effects of Ammonium Sulfate and Urea on the Growth of Five Species of Algae Isolated from Lowland Rice Cultures

MICHAEL R. BARRETT
University of North Alabama

Five species of Chlorophycean algae were isolated in unialgal cultures: *Bracteacoccus minor* (Chodat) Petrova, *Chlamydomonas* sp. 1, *Chlamydomonas* sp. 2, *Scenedesmus* sp. and *Uronema trentonense* Lee. Population growth curves were determined by cell counts in unialgal cultures with 25 or 50 ppm nitrogen added as ammonium sulfate or urea to the basic medium and in control cultures which had the same basic medium without the addition of a nitrogen source. Chlorophyll *a* concentrations were also used as an estimate of biomass. For most sample periods analysis of variance of cell density and/or Chlorophyll *a* concentration data supported the conclusion that a higher biomass was attained in cultures enriched with urea than those enriched with an equivalent amount of nitrogen as ammonium sulfate for *Scenedesmus* sp., *U. trentonense* and, especially, *B. minor*. ANOVA also supported the conclusion that the biomass was always lower in the controls than the nitrogen enriched cultures after the tenth day in culture.

(334)

Myxomycetes of Georgia: A Progress Report

HAROLD W. KELLER
Wright State University

LAFAYETTE FREDERICK
Howard University

RAY SIMONS
Fernbank Science Center

LEVESTER PENDERGRASS
United States Forest Service

The systematics, structure and ecology of the myxomycete biota in the state of Georgia have been under study since 1966. This study has involved field collections and moist chamber culture of bark samples from living trees. Forested areas in Atlanta, especially the Fernbank Science Center and Fort McPherson, were the principal sites for field collections. Bark samples for moist chamber culture were collected from trees in Panola Mountain State Park, a preserved natural area near Atlanta.

Specimens were gathered August 25, 1978, at the University of Georgia Botanical Gardens. Specimens collected from Georgia and deposited in the National Fungus Collections have also been included. At present, 150 species of Myxomycetes have been found. Several species represent new records for the State, and some collections represent new taxa. Some noteworthy collections are *Badhamia affinis*, *Badhamiopsis ainoae*, a species of *Comatrucha* with a surface net, *Cribraria minutissima*, *Diachea splendens*, *Dictydiaethalium plumbeum*, *Diderma corrugatum*, *Didymium orthonemata*, *D. synsporon*, *Lamproderma biasperosporum*, *Licea denudescens*, *L. operculata*, *Perichaena brevifila*, *P. microspora*, *Physarum bogoriense*, *P. penetrans*, an operculate species of *Trichia* with reticulate spores, and a new genus and species. Supported in part by NSF grants BMS 75-19098 and DEB 75-19098 AO1 to HWK.

(335)

The Occurrence of *Anomodon acutifolius* Mitt. (Musci) in Mexico

FRANK D. BOWERS

University of Wisconsin, Stevens Point

The genus *Anomodon* is widespread in Mexico with at least six taxa previously reported from the country. Some of the taxa occur in eastern North America and Asia with others occurring only in Asia and Mexico. *Anomodon acutifolius* has been found by the author in the state of Chihuahua, Mexico. This taxon has been previously reported only from the Himalayas, Taiwan and Japan and thereby is further illustration of the interesting phytogeographical relationship of some Asian-Mexican mosses. Its relationship with other *Anomodon* species with *Herpetineuron toccoeae* (Sull. & Lesq.) Card. will be discussed.

(336)

Aspects of Gametophyte and Sporophyte Development in *Isoetes riparia* (Lycopsidea)

DAVID L. SPELCE AND ROBERT D. COFFIN

Old Dominion University

The nucleus of the microspore divides producing a small posterior prothallial cell and a larger anterior antheridial initial. The initial and derivatives undergo mitotic divisions to produce four jacket cells and a primary spermatogenous cell. The primary spermatogenous cell undergoes meiosis to produce four androcytes. Cell division in the megaspore initiates beneath the triradiate ridge and proceeds basipetally and centrifugally. The basal portion contains much starchy tissue. The megaspore ruptures along the triradiate ridge and archeogonia are produced in the exposed tissue. Rhizoids grow from the surface megagametophytic cells. When young, the embryo is globular in shape. The embryonic foot grows basipetally and the primary leaf and root grow perpendicularly to the neck cells. The megagametophyte tissue forms a sheath around the developing primary leaf. Sporophytes became evident 10 to 14 days after sowing spores.

(337)

Studies on Myxomycetes from Bark of Trees in the District of Columbia

FITZ PATRICK RIGBY AND LAFAYETTE FREDERICK

Howard University

Studies have been in progress during the past two years on myxomycete occurrence and distribution on bark of living trees in the District of Columbia. The study has involved the moist chamber culture of bark samples collected from three tree species, viz., *Picea abies*, *Pinus taeda* and *Quercus alba* growing in selected localities. Bark productivity for myxomycete occurrence has varied from poor to abundant. Fourteen species of myxomycetes have been obtained in moist chamber culture. They are *Arcyria cinerea*, *Comatrucha fimbriata*, *C. laxa*, *C. nigra*, *Cribraria minutissima*, *Echinostelium minutum*, *Lamproderma arcyronema*, *L. cribrarioides*, *Licea minima*, *L. operculata*, *Perichaena chrysosperma*, *P. minor*, *Physarum viride* and *Trichia botrytis*. Preliminary results from the study indicate that (1) tree habitat within a city significantly influences the distribution of myxomycete species; (2) a distinct affinity appears to exist between some species of myxomycetes and tree species; (3) there is no marked variation in the vertical distribution of myxomycetes along the trunk of a tree and (4) seasonal changes appear to influence the occurrence of some species of myxomycetes but not others.

(338)

Growth of Blue-Green Algae with Myxomycete Plasmodia (Cyanophyta/Myxomycetes)

NORMAN A. FRANCIS AND RAYMOND L. PETERSEN

Howard University

Following the development of a stable, viable myxomycete-green alga system, attempts were made to forge stable myxomycete-blue-green algal associations. Such a union would be valuable as an experimental system for investigating nitrogen fixation. *Physarum polycephalum* was grown on various media at different pH levels with several genera of blue-green algae. Various degrees of association were observed. The formation of a full lichen-like association is preliminary to screening for the efficiency of nitrogen fixation by different genera, species and strains of blue-green algae.

(339)

Bioassays for Heavy Metal Contamination Based on Percent Fern Spore Germination and Gametophyte Growth Rate

RAYMOND L. PETERSEN AND DAMON ARNOLD

Howard University

The gametophyte generation of the sensitive fern, *Onoclea sensibilis* L., was employed in the development of two bioassays for heavy metal detection. Heavy metal ions tested were Hg^{++} , Cd^{++} and Co^{++} . The first bioassay was based on percent fern spore germination. Dilution series for each heavy metal (0-50 ppm) were prepared in petri dishes. Each plate was inoculated with

spores and after eight days the plates were scored for percent germination. The results are presented graphically and as equations based on regression line analysis. This spore germination bioassay is most sensitive for the quantitative determination of heavy metal ions within the range of 1-10 ppm. These results also demonstrate that the toxicities of the three heavy metals tested are directly proportional to their atomic weight. The second bioassay based on gametophyte growth rate is most sensitive for heavy metal detection within the range of 0.1-3.0 ppm.

(340)

Lipid Composition of the Oospores of the Aquatic Fungus, *Achlya* (Saprolegniaceae)

NORMAN C. FOX
Vanderbilt University

Oospores of *Achlya* produced on corn meal agar have been isolated by procedures involving sonication followed by filtration through nylon screen cloth of known porosity. Their lipid composition has been studied by standard techniques including gas and thin layer chromatography. The principal lipid components were triacylglycerols and unesterified fatty acids with smaller quantities of phospholipids and sterol esters. Small quantities of other compounds, including monoacylglycerols, diacylglycerols and unesterified sterols were also detected. In the triacylglycerol, unesterified fatty acid and phospholipid fractions, the predominant fatty acids were palmitic and oleic acids. In the sterol ester fraction, oleic and linoleic acids were abundant. Quantitative data will be presented concerning total lipids, total fatty acid content, unesterified fatty acids and the composition of the fatty acids making up the triacylglycerol, phospholipid and sterol ester fractions.

(341)

Southern Appalachian Endangered and Threatened Flowering Plants

J. DAN PITILLO
Western Carolina University

Like endangered and threatened plants elsewhere, such southern Appalachian species generally have exacting habitat requirements and low reproduction. Many of the species are endemics to the region. Some are relicts (e.g., *Cladrastis*, *Cymophyllus*, *Shortia*); others are of more recent origin (e.g., *Hudsonia montana* *Sagittaria fasciculata*). Often these species are clustered in small areas, such as Roan Mountain. Many species listed are naturally becoming extinct, but human activities contribute to endangeredness of others (e.g., *Lindernia saxicola*, *Shortia*, *Sagittaria fasciculata*). Very little species biology of these plants is known, but reasonable management requires this knowledge. Acquiring this knowledge may pose additional threats to the species, as the extremely rare *Isotria medeoloides*, for example; so techniques should be perfected on common types before manipulating endangered species. Management involving habitat manipulation is indicated from observations of many species such as *Sagittaria fasciculata* or *Sarracenia rubra* var. *jonesii*. Maintenance of cultivated stock while managing natural populations should insure the survival of endangered and threatened plants' genomes.

(342)

Survival Strategies of Southern Appalachian Pteridophytes

A. MURRAY EVANS
University of Tennessee

Pteridophytes of this region designated as endangered or threatened by various recently generated protection lists are here under consideration. An understanding of the reproductive biology and survival strategies becomes critically important if we are to document and understand these populations adequately enough to know what to protect/preserve/manage in order to maintain these taxa as part of the wider gene pool of biological diversity. Many of our listed pteridophytes occupy habitats which are restricted geographically and ecologically. For most we know little of the overall reproductive biology and potential on which the survival of these organisms ultimately depends. Examples drawn from our rare Appalachian pteridophytes will be used to address these questions.

(343)

Studies on the Ecology of Plant Species Endemic to Cedar (Limestone) Glades in Southeastern United States

JERRY M. BASKIN AND CAROL C. BASKIN
University of Kentucky

Cedar glade plant communities are edaphic "climaxes" of herbaceous species that occur on shallow, rocky limestone soils. In Southeastern United States, cedar glades occur in the limestone regions of Alabama, Georgia, Kentucky and Tennessee. Approximately 400 taxa have been collected on the glades, but many of these are weeds that have invaded following disturbance. Twenty or so taxa are endemic or nearly endemic to the Southeastern cedar glades. All of them are winter annuals (e.g., *Leavenworthia* spp.) or polycarpic perennials (e.g., *Astragalus tennesseensis* and *Psoralea subacaulis*). Life history strategies and adaptations of representative examples of the two ecological life cycle types will be discussed, and an hypothesis on growth and photosynthetic responses to light intensity will be offered as a partial explanation for the cause of their narrow endemism.

(344)

Endangered and Threatened Species of Plants on Granite Outcrops of Georgia

MADLINE P. BURBANCK
Emory University

Three species of plants endemic to granite outcrops are on Georgia's Protected Plant List: *Amphiantium pusillum*, *Isoetes melanospora* and *Sedum pusillum*. These species are endangered because the peculiar habitats to which they are restricted are not present on all outcrops and are disappearing primarily as a result of human disturbance. Although there are approximately 4,000 ha of granite outcrops in Georgia, some of the other 8-9 known endemics may become threatened because of habitat alterations as rock quarries are expanded

and real estate development continues and if recreational use of outcrop areas becomes excessive. The high incidence of endemism on granite outcrops suggests that they have been and many continue to be centers of speciation and therefore are of special interest to biologists.

(345)

**Endangered or Threatened Vascular Plant
Species of the Florida Sandscrub**

ROBERT KRAL
Vanderbilt University

One may extract from the updated (1978) Smithsonian list of endangered and threatened plants of the United States at least 30 species which appear confined to yellow or white sandscrub systems in Florida. Particularly endangered are those species found in the lake sector of central and southern peninsular Florida. Such species are discussed together with the reasons for their endangerment.

(346)

**Biology of the Snail Darter (*Percina tanasi*),
an Endangered Species**

DAVID A. ETNIER
University of Tennessee

In spite of its recent discovery, *Percina tanasi* now has the distinction of being the most extensively studied darter species. Recent studies completed by W. C. Starnes, University of Tennessee, and G. D. Hickman and R. B. Fitz, TVA, have added considerably to information available in the 1975 description. The most interesting aspect of snail darter biology discovered involves the extensive downstream drift of fry after hatching. Diet, age at maturity, reproductive behavior, fecundity, sex ratio, longevity, habitat requirements and predators will be considered.

(347)

**Biology of the Pine Barrens Treefrog
(*Hyla andersoni*)**

BRUCE MEANS
Tall Timbers Research Station

No Abstract Received

(348)

**The American Alligator: Studies of the Biology
of a Recovered Endangered Species**

I. LEHR BRISBIN, JR.
Savannah River Ecology Laboratory

The American alligator is unique among the endangered vertebrates of North America since its population numbers have now recovered in many parts of its range. As a result, many studies of the general biology of the alligator

have been undertaken in the past and can now also be planned for the future that would not have been possible with a rarer form. This presentation summarizes some of the unique aspects of the general biology of the American alligator and uses these findings as an example of the great potential value, in terms of general scientific information, that such an endangered species might represent. The application of information derived from studies of the alligator to broad problems of a general scientific interest is described.

(349)

**Behavioral Ecology of Red-cockaded
Woodpeckers**

JEROME A. JACKSON
Mississippi State University

The Red-cockaded Woodpecker is an endangered species that is endemic to the mature, open pine forests of the Southeastern United States. These forests have historically and prehistorically been maintained by fire, and this woodpecker, along with the pines, is a fire-adapted species. Many elements of the behavioral ecology of Red-cockaded Woodpeckers are unique and possibly related to its habitat preferences. The species lives in social groups called clans with most clan members participating in the reproductive activities at the group's single nest each year. Foraging is a group activity and occurs over an unusually large home range, though within the clan there are sex and age related differences in foraging behavior. In this presentation, I will discuss these and other aspects of the behavioral ecology of Red-cockaded Woodpecker clans studied in Mississippi, Georgia and South Carolina.

(350)

**Manatee Movements in Relation
to Water Temperature**

GALEN B. RATHBUN
National Fish and Wildlife Laboratory

The West Indian Manatee (*Trichechus manatus*) is an obligate aquatic herbivore that occupies shallow coastal fresh water and marine habitats in peninsular Florida. It is apparently unable to occupy areas where the water temperature remains below about 20 C for extended periods of time. This inability to tolerate low temperatures results in movements in response to seasonal changes in water temperature that are related to seasonal weather patterns. Throughout Florida there are numerous natural warm water springs and industrial warm water effluents that the manatees use as cold weather refugia. The use of one such refugium is related to daily weather patterns.

(351)

Phytochemical Advertisements for Pollinators

MORRIS LEVY
Purdue University

Like most successful merchandizers, flowering plants must advertise the location, quality and quantity of their

consumable goods in order to attract an appropriate pollinator clientele. The advertisements consist of integrated visual and olfactory signals designed for a particular group of insect, bird or bat pollen vectors. The signals promise, though sometimes deceptively, food, pheromonal or reproductive rewards, as well as provide both long-distance cues for floral detection and discrimination and short-distance cues for manipulations within the inflorescence. Visual signals involve floral size, geometry and color patterning with flavonoid and carotenoid pigments being chiefly responsible for the latter. Olfactory signals mark or mimic rewards for pollinators with terpenoids and esters/alcohols of various compounds being among the most common allurements and aphrodisiacs. The discussion of phytochemical advertisements for pollinators will focus on the comparative parallelisms of pollinator sensory acuity and phytochemical arrays in various pollination syndromes.

(352)

Pollinators and Foraging Behavior

LARRY L. WOLF
Syracuse University

Pollinators foraging for nectar are faced with a patchy environment, partly created by general habitat heterogeneity and partly created by their own foraging at a slowly renewing resource. I will argue that this patchy environment provides the selective regime necessary to produce foraging behavior designed to preferentially exploit the better patches. I will talk about the possible definitions of patches for nectarivores and the types of non-random data that are presently missing and that could be obtained by researchers in this aspect of plant-animal interactions.

AUTHOR/ABSTRACT-PROGRAM INDEX

Abbott, T.; 57
Abbott, D.; 165
Addison, D.; 251
Addison, L.; 163
Allen, B.; 59
Alsop, F.; 148
Anderson, H.; 17
Anderson, R.; 20
Andryszak, B.; 102
Arnold, D.; 339
Arway, J.; 191
Ashton, R.; 13
Atkinson, K.; 135
Atkinson, W.; 30
Babcock, M.; 104
Baker, C.; 292
Balsano, J.; 66
Barila, T.; 97, 98
Barrett, M.; 333
Barnett, O.; 70
Baskin, C.; 343
Baskin, J.; 343
Bates, V.; 241
Bath, D.; 164
Bauman, T.; 226
Beckmann, R.; 304, 305
Beets, J.; 7
Blem, C.; 263
Boettcher, P.; 137
Boettcher, R.; 314
Bogitsh, B.; 46
Bongers, L.; 276
Booker, K.; 141
Boom, B.; 210
Boring, L.; 113
Bortner, S.; 154
Bortone, S.; 84, 86, 87
Boschung, H.; 81, 173
Bosnak, A.; 100
Bostick, P.; 307
Bowers, F.; 335
Bozeman, J.; 303
Bradford, C.; 157
Bradley, W.; 9
Bragg, M.; 180
Brandes, W.; 14
Branson, B.; 11
Branstetter, S.; 80
Braun, J.; 325
Brisbin, I.; 223, 322, 348

Brown, R.; 204
Browne, E.; 241
Browne, M.; 131
Bruce, J.; 231
Buhse, H.; 160
Buikema, A.; 93, 275
Bulow, F.; 18, 19, 20
Burbank, M.; 344
Burge, R.; 101
Burgess, D.; 44
Burkhead, N.; 7
Burton, D.; 276, 277, 278, 279
Butler, G.; 235
Butts, J.; 43
Buxton, B.; 128
Caffey, W.; 156
Cairns, D.; 186
Cairns, J.; 149, 185, 280, 281
Cameron, J.; 187
Camp, J.; 41, 42
Campbell, E.; 242
Campbell, P.; 55
Cashner, R.; 171
Cathey, D.; 189
Chaffee, D.; 271
Chandler, C.; 180
Chandler, G.; 76
Chasko, G.; 222
Chen, J-M.; 265, 270
Cherry, D.; 149, 280, 281
Cheshire, J.; 247
Clamp, J.; 253
Clark, G.; 116
Clark, J.; 185
Clark, R.; 109
Clebsch, E.; 295
Coats, N.; 153
Coburn, C.; 187
Coffin, R.; 336
Coggin, J.; 163
Coile, N.; 211
Condley, B.; 116
Conner, J.; 20, 21
Contos, N.; 136
Cook, W.; 48
Cooper, C.; 23, 91
Corkum, K.; 137, 138, 142
Cowie, R.; 270
Cox, W.; 257, 258
Craven, H.; 192

Creek, R.; 32
 Cropper, W.; 121
 Cross, E.; 226
 Crowley, P.; 298A
 Cunningham, D.; 126
 Cunningham, P.; 165
 Current, W.; 129, 130
 Dal Santo, D.; 105
 Daniel, R.; 165
 Davenport, L.; 214
 Davies, W.; 5
 Davis, K.; 58, 90, 145, 146
 Day, F.; 117, 200
 Day, S.; 50
 Deason, T.; 235, 239
 Debro, L.; 332
 Dechant, T.; 283
 De La Cruz, A.; 124, 224
 Delcourt, H.; 119, 123
 Delcourt, P.; 123
 DeSelm, H.; 116, 122, 205, 293
 Dew, K.; 289
 DeYoung, H.; 293
 Dickson, K.; 185
 Dillard, G.; 233
 Dixon, K.; 95
 Dobie, J.; 262
 Dodd, C.; 177
 Dodd, L.; 144
 Donahue, E.; 87
 Donnelly, L.; 64
 Dorr, L.; 301
 Dorward, E.; 103, 104
 Doucette, A.; 16, 170
 Downey, P.; 21
 Drapalik, D.; 316
 Drysdale, D.; 83
 DuBay, D.; 318
 Dundee, D.; 133, 274
 Dunn, B.; 294
 Duobinis, E.; 256
 Dyck, L.; 330, 331
 Dylewski, D.; 234
 Eagleson, K.; 101
 Eickmeier, W.; 202
 Elliott, L.; 236, 328
 Entrekin, D.; 38
 Eplee, R.; 36
 Ervin, G.; 143
 Esch, G.; 41, 42
 Etges, W.; 65
 Etnier, D.; 73, 74, 346
 Evans, A.; 342
 Evans, D. K.; 199, 302
 Evans, D. W.; 103, 104
 Fannaly, M.; 82
 Feeney, T.; 87
 Fitzsimmons, J.; 16
 Flickinger, G.; 156, 157, 158
 Flory, W.; 62, 308
 Foster, C.; 51
 Fox, N.; 340
 Francis, N.; 338
 Franz, R.; 321
 Frederick, L.; 334, 337
 Freeman, J.; 317
 Fugler, C.; 260
 Funderburg, J.; 321
 Furry, J.; 199
 Gant, R.; 295
 Garrett, H.; 133

Gates, J.; 219, 220, 221, 222
 Giattina, J.; 280
 Gibbons, J.; 267, 327
 Giesy, J.; 225
 Gilbert, R.; 8
 Gillespie, M.; 60
 Goeke, G.; 255
 Gooden, T.; 248
 Grady, J.; 171
 Graham, R.; 181
 Graney, R.; 281
 Greene, J.; 267, 327
 Gresham, P.; 152
 Griffin, D.; 238
 Gutzke, W.; 263
 Hackney, C.; 124, 256
 Hall, L.; 277, 278, 279
 Handsel, T.; 17
 Hansen, M.; 236
 Hanson, W.; 44
 Hardin, J.; 207
 Hardman, J.; 29
 Harman, D.; 219
 Harris, J.; 14
 Harris, T.; 2, 75
 Hart, K.; 186
 Harvey, R.; 285
 Hashimoto, K.; 164
 Hawkins, J.; 235
 Hawkins, W.; 51
 Haynes, R.; 299
 Heidt, A.; 8
 Heim, D.; 120
 Heisler, N.; 60
 Hemmerly, T.; 108
 Henebry, M.; 186
 Herr, J.; 63
 Herr, N.; 198
 Herring, R.; 284
 Herrman, R.; 101
 Hicks, M.; 240
 Hill, S.; 3
 Hinkle, C.; 122, 205
 Ho, P.; 47
 Hoberg, C.; 24
 Hocutt, C.; 15, 94, 95, 96, 97, 98
 Hoffman, G.; 162
 Holbrook, T.; 45
 Hollingsworth, C.; 84
 Honig, R.; 275
 Hopkins, T.; 251, 255, 320
 Hotchkiss, M.; 316
 Howard, C.; 244
 Huck, R.; 309
 Hudson, W.; 18
 Hull, J.; 290
 Humphrey, W.; 224
 Hunt, E.; 288
 Hurt, V.; 286
 Jackson, J. A.; 349
 Jackson, J. F.; 297
 James, B.; 19
 Jenkins, R.; 12
 Jenner, C.; 252
 Jenner, M.; 252
 Jeselnik, D.; 223
 Johnson, D.; 33, 34
 Johnson, R.; 31
 Jones, A.; 158
 Jones, J.; 195
 Jones, K.; 72
 Jones, M.; 52, 61

- Jones, R. A.; 70
 Jones, R. L.; 215
 Jones, S. B.; 206
 Jones, S. M.; 294
 Jun, J.; 47
 Kalmus, G.; 159
 Kanzaki, T.; 164
 Kathman, D.; 26
 Keaton, G.; 267
 Keever, C.; 110
 Keith, W.; 150, 151, 152
 Keller, H.; 334
 Kennedy, M.; 319, 325
 Kimbrough, T.; 52, 53, 61, 153
 Kirby, J.; 184
 Kirven, R.; 162
 Knight, L.; 25
 Knox, G.; 27, 28
 Koch, W.; 166
 Kraemer, J.; 6
 Kral, R.; 345
 Kuhn, D.; 186
 Kuhn, R.; 126
 Ladino, A.; 220
 Lake, C.; 68
 Landry, G.; 311
 Langley, A.; 324
 Larner, E.; 56
 Larrick, S.; 149, 280
 Larson, G.; 190
 Lauter, F.; 54
 Lawrence, J.; 331
 Lawson, V.; 27, 28
 Lee, D.; 13, 321
 Leedom, W.; 134
 LeGrande, W.; 168
 Levine, S.; 82
 Levy, M.; 351
 Lewis, E.; 195
 Liden, L.; 276, 277
 Lieux, M.; 118
 Lindahl, R.; 59, 67, 81, 320
 Lindquist, D.; 2, 17, 75, 76, 79
 Lindsay, M.; 132
 Linkins, A.; 57
 Lispi, D.; 96
 Llewellyn, G.; 31, 53, 153
 London, C.; 39
 Lotz, J.; 138
 Luckner, C.; 170
 Lutz, P.; 247
 Luvall, J.; 35
 MacDonald, M.; 296
 MacKenzie, M.; 196
 Madsen, L.; 170
 Marbury, K.; 139
 Margrey, S.; 276, 277, 278, 279
 Marion, K.; 257, 258, 296
 Markham, K.; 242
 Martin, W. H.; 287
 Martin, W.W.; 282
 Martino, L.; 89
 Matheson, R.; 167
 Mathews, R.; 101
 Matthews, J.; 216
 Matthews, W.; 12
 McCall, J.; 39, 47
 McCarthy, J.; 71
 McClurkin, I.; 68
 McCollough, N.; 101
 McCormick, J.; 227
 McCracken, M.; 139
 McCrimmon, J.; 115
 McDonald, C.; 115
 McHenry, J.; 23
 McInnis, T.; 329
 McLeod, K.; 198, 201
 McMillan, M.; 266
 McWethy, M.; 298
 Melisky, E.; 94
 Mellichamp, J.; 315
 Middendorf, G.; 264
 Miller, C.; 234
 Miller, G.; 49, 50
 Miller, P.; 67
 Mobley, R.; 131
 Modlin, R.; 92
 Mohlenbrock, R.; 213
 Molloy, B.; 107
 Monaco, P.; 66
 Mondl, M.; 41, 42
 Moore, D.; 319, 325
 Moore, N.; 242
 Morgan, E.; 26, 89, 100, 101, 190, 191
 Morrison, L.; 162
 Morrow, A.; 239
 Moser, G.; 192
 Muir, M.; 208
 Murphey, C.; 35
 Murphy, G.; 259
 Murphy, J.; 115
 Musselman, L.; 313
 Mysing-Gubala, M.; 249
 Nance, R.; 40
 Nelson, C.; 246
 Nelson, D.; 244, 245
 Newman, G.; 55
 Nickrent, D.; 312
 Nieland, D.; 172
 Nungesser, M.; 268
 Obi, A.; 22
 Oglesby, J.; 86
 O'Kelley, J.; 29, 235
 Oliver, J.; 38
 O'Rear, C.; 31
 Orr, J.; 89
 Orser, J.; 233
 Ostman, N.; 203
 Ostrowski, R.; 69
 Pafford, J.; 316
 Parker, B. C.; 189
 Parker, B. W.; 45
 Parker, N.; 58, 90
 Parrish, R.; 88
 Patton, S.; 139
 Pav, D.; 148, 265, 270
 Pendergrass, L.; 334
 Penn, J.; 88
 Petersen, R.; 338, 339
 Pezold, F.; 171
 Phillis, W.; 43
 Pilatowski, R.; 310
 Pinder, J.; 225
 Pistolas, S.; 15
 Pittillo, J.; 341
 Plafkin, J.; 186
 Plummer, G.; 114
 Poirrier, M.; 249
 Porak, W.; 191
 Porter, D.; 232
 Porter, L.; 242
 Quinn, M.; 287

Ragland, H.; 322
 Ragsdale, H.; 121, 289
 Rasch, E.; 66
 Rathbun, G.; 350
 Reading, J.; 93
 Reish, R.; 95
 Reynolds, K.; 153
 Richardson, E.; 330
 Rigby, F.; 337
 Riopel, J.; 37
 Ritchie, J.; 23
 Roberson, E.; 39, 40
 Robertson, J.; 148, 265
 Robertson, P.; 196, 197, 292
 Robinson, H.; 78
 Robson, D.; 326
 Rodgers, J.; 105, 106, 107, 281
 Rogers, G.; 303
 Rogers, M.; 43
 Ross, J.; 29
 Rothe, C.; 165
 Roush, K.; 91
 Rupert, E.; 70, 71
 Rushton, P.; 154
 Rutherford, C.; 56
 Ryals, P.; 160
 Sakas, P.; 129
 Sarphie, T.; 51
 Saul, B.; 284
 Schalles, J.; 230
 Schiebe, F.; 23
 Schmalzer, P.; 122
 Schubauer, J.; 323
 Schwartz, F.; 3, 4
 Scott, A.; 262
 Scott, R.; 290
 Scott, W.; 161
 Seagle, H.; 192
 Semlitsch, R.; 261
 Seyle, C.; 269
 Shabica, S.; 125, 229
 Shafer, S.; 53
 Shaheen, C.; 150, 151
 Sharitz, R.; 120
 Shaw, J.; 251
 Shelton, W.; 5
 Sherrod, C.; 201
 Shih, C-F.; 140
 Shipp, E.; 14
 Shipp, L.; 188
 Shipp, R.; 1
 Short, R.; 134, 136
 Shure, D.; 288, 318
 Shute, J.; 79
 Shute, P.; 79
 Sickel, J.; 273
 Siegel, D.; 86
 Simco, B.; 146
 Simmons, G.; 189
 Simon, C.; 264
 Simons, R.; 334
 Skeen, J.; 289
 Smith, C. J.; 142
 Smith, C. S.; 259
 Smith, G.; 62, 308
 Smith, H.; 67, 160, 161
 Smith, M. H.; 65
 Smith, M. J.; 147
 Smith, M. L.; 159
 Snelson, F.; 10
 Speice, D.; 336
 Stalter, R.; 193
 Starnes, W.; 73

Stauffer, J.; 15, 94, 95, 96, 97, 98
 Steffens, J.; 37
 Stirewalt, H.; 284
 Stone, B.; 30
 Stucky, J.; 217, 218, 304
 Stutts, J.; 208, 209
 Suarez, M.; 182
 Sundberg, W.; 237
 Sweeney, J.; 190
 Swofford, D.; 11
 Sykes, E.; 232
 Talton, E.; 49
 Tarter, D.; 271
 Tate, L.; 51
 Tatum, F.; 81
 Teague, R.; 216
 Thigpen, S.; 284
 Thomas, C.; 54
 Thomas, R.; 284
 Thompson, B.; 82
 Thompson, E.; 221
 Thompson, R.; 300
 Timmons, T.; 5
 Tolbert, V.; 272
 Tomasso, J.; 90, 146
 Touart, L.; 85
 Train, E.; 200
 Trauth, S.; 269
 Truesdale, F.; 102, 174
 Truett, M.; 284
 Tryba, S.; 237
 Tunnell, G.; 244
 Tuttle, R.; 320
 Ultsch, G.; 60
 Van Den Avyle, M.; 19
 VanEnk, R.; 328
 Van Horn, G.; 111
 Vann, D.; 96
 Vaughn, G.; 272
 Verret, S.; 82
 Vidrine, M.; 250
 Walker, H.; 173
 Wallace, J.; 242
 Wallace, L.; 106
 Wallace, R.; 77
 Walne, P.; 64
 Walter, R.; 178
 Ward, B.; 243, 332
 Watson, F.; 306
 Weathersby, A.; 140
 Weaver, G.; 195, 203, 204, 292
 Weaver, M.; 53
 Webster, W.; 260
 Weekley, L.; 52, 53, 61
 Weiss, E.; 112
 Wells, M.; 143, 144
 Weppner, W.; 163
 West, D.; 119
 West, J.; 283
 Wheat, B.; 48
 Whigham, D.; 298
 Whipple, S.; 291
 Whittington, D.; 25
 Wickland, D.; 194
 Wickstrom, C.; 182, 183
 Wiernicki, C.; 83
 Wilkins, K.; 228
 Wilkinson, E.; 212
 Williams, A.; 72, 155
 Williams, C.; 244
 Williams, J.; 74, 78
 Williams, R.; 97

Wilson, L.; 175
Wilson, R.; 69
Winstead, J.; 286
Withrow, C.; 254
Woldeyesus, Y.; 155
Wolf, L.; 352
Wright, M.; 145, 146

Wygoda, M.; 176
Wylie, P.; 179, 260
Yongue, W.; 127, 141, 189
Zattau, W.; 329
Zehren, S.; 169
Zeto, S.; 302

The Thursday Evening General Session

The 1979 Thursday evening program features a symposium on Pollination Biology co-sponsored by the Association and the Southeastern Section of the Botanical Society of America. *Dr. James W. Wallace*, Professor of Biology, Western Carolina University, made the arrangements for this program and will introduce the topic and speakers. The symposium includes both the plant and animal aspects of pollination and should be of interest to all members of ASB. The first speaker is a botanist dealing with the chemical attractants, and the second is a zoologist concerned with foraging behavior.

Dr. Morris Levy is Associate Professor of Biology, Purdue University. He received the Ph.D. at Yale University and is interested in plant ecology, biosystematics and evolutionary biology. The title of his presentation is "Phytochemical Advertisements for Pollinators" (Abstract No. 351).

Dr. Larry L. Wolf is Professor of Zoology, Syracuse University. He received the Ph.D. at the University of California, Berkeley, and is interested in vertebrate zoology, ecology and social behavior. The title of his presentation is "Pollinators and Foraging Behavior" (Abstract No. 352).

ASB Candidates for Office — 1979

The Nominating Committee, composed of Walter Flory, Lee Shanor and Chairman John Herr, has selected the following slate of nominees for the ASB offices to be filled this year. Voting will take place at the Annual Business Meeting, Friday, April 27. Additional nominations may be made from the floor.

President-Elect: — FRANKLIN F. FLINT, Randolph-Macon College
— BERYL C. FRANKLIN, Northeast Louisiana University

Vice-President: — J. FRANK MCCORMICK, University of Tennessee
— RUDOLPH PRINS, Western Kentucky University

Secretary: — CAROL C. BASKIN, University of Kentucky
— J. DAN PITILLO, Western Carolina University

Executive Committee: — SARA N. BENNETT, Georgia Southern College
(3 positions) — TEMD R. DEASON, University of Alabama
— SAMUEL B. JONES, University of Georgia
— GEORGE S. RAMSEUR, University of the South
— JAMES L. RIOPEL, University of Virginia
— SHIRLEY C. TUCKER, Louisiana State University



Franklin F. Flint
(President-Elect)

Dr. Flint is Charles A. Dana Professor of Biology and Head of the Department of Biology at Randolph-Macon Woman's College. He received the B.S. degree from Lynchburg College and the M.S. and Ph.D. degrees from the University of Virginia.

His current research interests are in the ultrastructure of the angiosperm embryo sac. He was a Research Associate with the late Donald A. Johansen of California with whom he published. He has had research grants from the American Philosophical Society, the American Academy of Arts & Sciences, the National Science Foundation and the U.S. Department of Energy.

He was a Fulbright-Hayes Senior Research Scholar at Estacao Agronomica Nacional, Oeiras, Portugal, in 1964-65. He was President of the Lynchburg Sigma Xi Club in 1965-66. He was Staff Biologist to the Commission on Undergraduate Education in the Biological Sciences and Research Professor of Biology at George Washington University in 1968-69. He was President of the Virginia Academy of Science in 1972-73 and a member of the Council of AAAS in 1972. He served on the Board of Directors of the Virginia Science Museum Foundation, Inc., and was its Vice-President. He is a member of the Board of Directors of the Virginia Chapter, The Nature Conservancy, the Soil and Water Conservation Districts and is currently Vice-President of the Virginia Association of Conservation Districts. He has been a member of the Education Committee of

AIBS since 1973 and was a member of the Botanical Society of America Council in 1974-75. He served as Secretary (1974-75), Program Chairman (1975-76) and Chairman (1976-77) of the Teaching Section of the Botanical Society of America. He was elected a Fellow of the AAAS in 1972 and Fellow of the VAS in 1975.

Dr. Flint has been a member of ASB since 1952 and served as Chairman of its Standards Committee from 1969-72. He was ASB representative to the AIBS Governing Board from 1969-72 and representative to Section G, AAAS from 1974 to the present. He served as Vice-President of ASB in 1976-77.



Beryl C. Franklin
(President-Elect)

Educated at Kentucky Wesleyan College, the University of Kentucky and the Ohio State University, Dr. Franklin has been a member of the faculty at Northeast Louisiana University, where he is currently Professor of Biology, since 1959. His research interests are in mammalian reproductive physiology, and he is the author of several papers in this field. A member of several professional societies, including the American Society of Zoologists, he was President of the Louisiana Academy of Science in 1967-68. At present, he is a member of the Adjunct Faculty of the Center on Aging at Northeast Louisiana University and is presently developing a course on the Biology of Aging.

Dr. Franklin has served ASB as Chairman of the Travel Awards Committee in 1973-74. He has served

on the Executive Committee of ASB and is currently Vice-President, a position in which he has been active in securing private contributions for the Association's student travel awards.

J. Frank McCormick (Vice-President)

J. Frank McCormick is Professor and Director, The Graduate Program in Ecology, University of Tennessee, Knoxville. He received the B.S. in Biology from Butler University and the M.S. and Ph.D. from Emory University. He served as Assistant Professor of Biology, Vanderbilt University, 1961-63 and as Assistant Professor of Zoology, University of Georgia, 1963-64; while at the University of North Carolina (1964-74), he became Professor of Botany and Ecology and Director, Ecology Training Program. During the past year, 1977-78, while serving as Senior Ecologist, U.S. Department of the Interior, he worked with the U.S. Fish and Wildlife Service and the Office of Surface Mining. He has served on the Awards, Conservation and Executive Committees of ASB and represented ASB before Congressional hearings on the Tellico Dam and Snail Darter issue. For six years (1971-76) he served as Secretary of the Ecological Society of America, during which time he helped to establish the SE Chapter of ESA which meets annually with ASB. He has served on several committees of the National Academy of Sciences and presently serves on the President's Interagency Taskforce on Environmental Monitoring and the Department of Energy's Taskforce on National Environmental Assessment. He has directed the research of more than 25 graduate students and has approximately 75 publications in basic and applied ecology.

Rudolph Prins (Vice-President)

Dr. Prins, Professor of Biology at Western Kentucky University, received the B.A. degree from Calvin College, M.A. from Western Michigan University and Ph.D. from the University of Louisville. He has had experience in high-school teaching, was an Assistant Professor of Zoology at Clemson University, Visiting Professor at the University of Oklahoma Biological Station and at the Tech Aqua Biological Station, and has been at Western Kentucky University since 1968. His teaching and research interests are in the areas of invertebrate zoology and limnology.

Dr. Prins is a member of several professional societies including the American Society of Limnology and Oceanography and AAAS. He served as Secretary of the Kentucky Academy of Science from 1972-77; Vice-President, 1977; and is currently President-Elect of that organization. Having been a member of ASB since 1963, he has served on several committees and is currently completing a term on the Executive Committee.

Carol C. Baskin (Secretary)

Dr. Baskin received the B.S. degree from Florida Southern College and the Ph.D. degree from Vanderbilt University. Although she holds no official appointment at the University of Kentucky, she has worked there with her husband, Dr. Jerry Baskin, since 1968. They are both plant autecologists, and their joint research effort has resulted in the publication of numerous articles on various aspects of the ecological life cycle strategies of both weedy and nonweedy (including Southeastern U.S. cedar glade endemics) plant species. Carol has been a member of ASB since 1965. She also is a member of the Ecological Society of America, Torrey Botanical Club and Botanical Society of America. At present, she serves as secretary and program chairman of the Ecological Section of the Botanical Society.

J. Dan Pittillo (Secretary)

Professor of Biology at Western Carolina University, Dr. Pittillo received the A.B. from Berea College (1961), M.S. from the University of Kentucky (1963), and Ph.D. from the University of Georgia (1966). As a member of Western Carolina's faculty since 1966, he has taught subjects varying from cellular biology to plant ecology and natural history of the Southern Appalachians.

Research interests include distributional and ecological studies of native flora, and threatened and endangered species. He is currently working with the University of Tennessee in the vegetational history of the southeast project. Besides a number of papers, he has written a manual for management of the Blue Ridge Parkway plant habitats (1977) and completed the Natural Landmarks study of the Southern Blue Ridge (1976) for the National Park Service.

He is a past member of the Place of Meeting Committee of the Association of Southeastern Biologists, past president of the Southern Appalachian Botanical Club, and is conservation committee chairman for the N.C. Academy of Science and for the Highlands Biological Foundation. He is a member of Sigma Xi, American Institute of Biological Sciences, Torrey Botanical Club and the Ecological Society of America. He is a consultant to the North Carolina Nature Conservancy and serves the North Carolina Department of Natural Resources and Economic Development on the Natural Areas Advisory Committee.

Sara Neville Bennett (Executive Committee)

Dr. Bennett received B.S. (1964), B.S.Ed. (1964) and M.S. (1967) degrees in biology from Georgia Southern College and the Ph.D. (1975) in microbiology from

the University of Georgia. She has held Faculty Development in Georgia assistantships and NSF predoctoral research assistantships. She is Associate Professor of Biology at Georgia Southern College where she has been on the faculty since 1966. At GSC, she is a member of the Admissions and Pre-Professional Committees.

Dr. Bennett is a member of several professional societies, including the Genetics Society of America, the Georgia Academy of Science, the Southeastern Branch of the American Society for Microbiology and the Society of the Sigma Xi. She has been a member of ASB since 1967.

Her teaching interests include genetics, cellular biology and animal anatomy. Her research interests are in genetics of *Neurospora*.

T. R. Deason

(Executive Committee)

Professor of Biology and Director of the EM Laboratories at the University of Alabama, Dr. Deason received the B.S. (1954) and M.S. (1958) from the University of Alabama and the Ph.D. from the University of Texas (1960). He joined the faculty of the University of Delaware in 1960 but returned to the University of Alabama in 1961.

Dr. Deason's research interests center around the morphology and taxonomy of soil algae. His present emphasis is on the ultrastructure of cell division as it applies to taxonomic and phylogenetic relationships.

Dr. Deason is a member of ASB, SEEMS, AIBS, The Phycological Society of America, The British Phycological Society and The International Phycological Society. He served as ASB Program Chairman for the 1978 meetings in Tuscaloosa. In 1974-75 he received an award from The Alexander von Humboldt Foundation of the Federal Republic of Germany for outstanding achievement in teaching and research.

Samuel B. Jones, Jr.

(Executive Committee)

Professor of Botany and Curator of the Herbarium at the University of Georgia, Dr. Jones received the B.S. (1955) and M.S. (1961) from Auburn University and the Ph.D. from the University of Georgia (1964). He has been at the University of Georgia since 1967. From 1964 to 1967, Dr. Jones was an Assistant Professor at the University of Southern Mississippi.

Dr. Jones' research has dealt with the systematics of the tribe Vernonieae of the Compositae Family. In addition, he has published a series of papers on the Flora of Mississippi. Dr. Jones has authored or co-authored over 80 journal papers and book chapters. He is senior author of a taxonomy textbook, *Systematic Botany*, recently published by McGraw-Hill.

He is a member of the ASB, Botanical Society of America, American Society of Plant Taxonomists, Southern Appalachian Botanical Club, New England Botanical

Club, Torrey Botanical Club, Society for the Study of Evolution, Phi Beta Kappa, Phi Kappa Phi, Sigma Xi and Gamma Sigma Delta.

George S. Ramseur

(Executive Committee)

Dr. Ramseur is Professor of Biology at The University of the South having joined the faculty there in 1958. He received the A.B. degree from Elon College and M.Ed. and Ph.D. degrees from the University of North Carolina.

Dr. Ramseur has been a member of ASB since 1958 and served as President of the Southern Appalachian Botanical Club in 1971. His research interests include the vegetation of the Southeastern Spruce-Fir forests and plant succession. His interest in science education is reflected in his having served on the writing team for the AAAS curriculum project, "Science, A Process Approach," and as a consultant to the Summer Institutes in India project.

Shirley C. Tucker

(Executive Committee)

Dr. Shirley Tucker was raised in Minneapolis and St. Paul, Minnesota, and earned B.A. and M.S. degrees at the University of Minnesota. She obtained the Ph.D. degree at the University of California (Davis) working in plant anatomy. She spent a year as a Fulbright scholar at the University of Reading, England. She held NSF grants for research at the University of Minnesota and at Northwestern University, Evanston, Illinois. For the past 12 years she has taught at Louisiana State University, Baton Rouge, where she is currently a Professor of Botany.

Dr. Tucker's research interests include developmental anatomy of vascular plants and the lichen flora of southeastern United States. Her research has resulted in about fifty publications. The work on floral development has been supported by several NSF grants at LSU.

She is currently Vice-President of the Botanical Society of America, and served three years as its program director. She is President of the LSU chapter of Sigma Xi, and has served as Treasurer and Vice-President of the organization as well. She is active in the Louisiana Academy of Sciences, and holds membership also in the Association of Southeastern Biologists, Phi Beta Kappa, American Bryological and Lichenological Society, British Lichenological Society, International Association of Lichenology and the Linnean Society of London (Fellow).

James L. Riopel

(Executive Committee)

Dr. Riopel, Associate Professor of Biology at the University of Virginia, was Associate Dean of the Graduate School of Arts and Sciences (1968-69) and has been Co-

Director of the Mountain Lake Biological Station since 1961. As a member of ASB, he co-chaired the Local Arrangements Committee for the Charlottesville meeting.

Dr. Riopel is a developmental botanist and author of *Experiments in Developmental Botany*. His research at

Virginia has been concerned with positional patterns for lateral root initiation and the hormonal regulation of xylem differentiation in cell suspension cultures. Current studies are examining the physiology of haustorial development in parasitic angiosperms.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — James Wilkes, Troy State University

Florida — Vacant

Georgia — Fred K. Parrish, Georgia State University

Illinois — George T. Weaver, Southern Illinois University

Kentucky — Joe E. Winstead, Western Kentucky University

Louisiana — Harry J. Bennett, Louisiana State University

Maryland — Don Windler, Towson State University

Mississippi — James T. Murrell, Mississippi University for Women

North Carolina — Vacant

South Carolina — G. Thomas Riggan, Jr., Newberry College

Tennessee — John R. Freeman, University of Tennessee at Chattanooga

Virginia — Jean Pugh, Christopher Newport College

West Virginia — Roy B. Clarkson, West Virginia University

JON R. FORTMAN — *News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

About Institutions

University of Central Florida, Orlando. The name of Florida Technological University was officially changed to "University of Central Florida" on December 6, 1978, by the Florida legislature. The Department of Biological Sciences at UCF recently welcomed a new "lady" to the ranks of its research team. She is a 28 ft. stern-rigged trawler powered by a 200 hp diesel engine. Designed to further coastal marine research in the Kennedy Space Center region, R/V PEGASUS is skippered by **Dr. Franklin F. Snelson, Jr.**, Associate Professor of Biological Sciences.

University of Southwestern Louisiana. The Estuarine Biology Summer Program at the Fearman Bayou Field Station will be held June 4 to July 27, 1979. The station is located in a brackish coastal marsh of the 15,000 acre State Wildlife Refuge on the western shore of Vermilion Bay, Louisiana, and is accessible only by boat or plane. Students will spend a four-day period of each week at the Station or at other field sites on the northern Gulf coast. Faculty working with the program are: **Dr. Darryl L. Felder**, **Dr. Courtney T. Hackney** and **H. Dickson Hoese**. Living quarters for men and women are available at the Field Station, as well as meals. For more information contact: **Dr. Courtney T. Hackney**; Department of Biology; University of Southwestern Louisiana; Lafayette, LA 70504.

College of Charleston. The department is now offering, in addition to the B.A. and B.S. in Biology, a B.S. and a M.S. in Marine Biology.

East Tennessee State University. The Departments of Biology, Health Science and General Science have

been combined into the Department of Biological Science. It is chaired by **Dr. Robert Samuels**, who was previously at Indiana University-Purdue University, Indianapolis. Extensive curriculum revision has occurred because of the merger and in preparation of the University's conversion to the semester system in the Fall of 1980.

University of Tennessee, Knoxville, Botany Department. The graduate program has recently been broadened by including a non-thesis M.S. option to the existing M.S. and Ph.D. thesis programs. Further information about this option may be obtained from the Coordinator of Graduate Studies, **Dr. James D. Caponetti**. The Department is also planning a summer program in field courses beginning the summer of 1979. The following were being planned, but only a few will be offered each summer: Methods in Field Ecology, Field Phycology, Woody Plant Identification, Field Lichenology, Synanthology, Field Bryology, Aquatic Vascular Plants and Field Mycology.

University of Virginia. Postdoctoral stipends for field research at the Mountain Lake Biological Station are available. The stipends are for \$1500, and proposals for studies on a wide variety of terrestrial and fresh water environments at Mountain Lake will be considered. The deadline for these summer stipends is May 15, 1979. Contact: **Dr. James L. Riopel**, Director; Mountain Lake Biological Station; University of Virginia; Charlottesville, VA 22903. The following courses will be offered at the Biological Station this summer: June 18-July 17, Field Biology of Green Plants, Taxonomy and Ecology of Bryophytes, Biology of Parasitic Angiosperms, Animal

Behavior, Ornithology and Experimental Animal Ecology; July 19-August 17, Aquatic Ecology, Algology, Mycology, Forest Ecology, Paleobotany and Entomology. For further information, write to **Dr. Riopel**, Director.

Old Dominion University. The International Symposium on Groundwater Biology, a combination of the 4th International Colloquium on *Gammarus* and *Niphargus* and the 2nd International Symposium on Groundwater Ecology, was held in Blacksburg, Virginia, September 10-16, 1978. The Symposium was co-sponsored by Old Dominion University and Virginia Polytechnic Institute and S.U. and supported in part by a grant from the National Science Foundation. Forty-eight scientists, representing 14 countries, registered for the Symposium. A total of 39 papers covering a variety of topics was presented in 8 formal paper sessions. The papers given

at the Symposium will be published as Proceedings in 1979. Those dealing strictly with amphipod biology will be published in a special supplement to *Crustaceana*, and those concerning groundwater ecology in the *International Journal of Speleology*. A third combined meeting will be held near Lodz, Poland, in 1980.

Tech Aqua Biological Station. Ten courses have been scheduled to be offered at the Tech Aqua Station on Center Hill Reservoir from June 8-August 18, 1979: Wildlife Parasitology, Local Flora, Plant Ecology, Biology of the Chironomids, Ichthyology, Protozoology, Freshwater Algae, Animal Population Dynamics, Freshwater Invertebrates and Limnology. Complete details about the program may be obtained from **Dr. Robert E. Martin**; Box 5041; Tennessee Tech; Cookeville, TN 38501.

Challenges And Opportunities For ASB

Beyond all else, ASB is a regional association. As the largest and most active of regional biological societies, ASB has contributed significantly to biological science and to biologists. However, significant challenges and opportunities remain before us. Our composition and activities are indeed regional but do not adequately represent biological science in the Southeast. An honest analysis reveals a predominance of field biologists whose ecological and systematic orientation strongly underlies our geographic comradery. Our professional association with one another through ASB offers more than a common geography as a basis for scientific and professional fulfillment. Larger than any single university, and smaller than AIBS or AAAS, ASB has long been an ideal forum for scientific contributions by students and young faculty. ASB can serve equally well this common need of students and faculty of microbiology, physiology or ecology. Active participation by cellular and molecular biologists will benefit students and faculties of all Southeastern colleges and universities. On most campuses we strive to develop well balanced curricula. The obvious reasons for doing so are no less valid for our regional association. Students and faculty members of ASB come primarily from colleges of Liberal Arts. Yet, our association lacks a liberal representation of biologists. We need an affirmative action program to recruit laboratory biologists.

The Southeastern region is a unit of scale with which we can easily identify and within which our actions and interests can have significant impacts. It is often difficult for students or faculty to identify with national issues or programs, even within the relatively narrow scope of our mutual biological interests. On the other hand, local issues often escape our attention. Through ASB we have an opportunity to call attention to regional issues of biological significance and to use our collective resources to resolve them. Appropriate issues may range from a locally high incidence of a specific cancer to mismanagement of wild boar or wild rivers. A few disciplines, including ecology, parasitology, ichthyology and herpetology are already organized as Southeastern sections. Their affiliation with ASB provides a source of technical guidance and a means of implementing teaching or research projects. A special need, which ASB could uniquely fill, is an assessment of regional plans and programs of federal agencies. An appropriate example is the recent announcement by EPA of an integrated approach to environmental protection on a regional scale. Is it appropriate for ASB to identify or encourage development of interinstitutional teaching, research or assessment activities which are especially well suited for regional analysis?

I encourage the officers, executive committee and membership of ASB to consider the desir-

ability of pursuing two goals: (1) to more realistically represent biological science in the South-eastern U.S., and (2) to initiate interinstitutional programs for the scientific analysis of biological issues of regional significance. In the jargon of my own discipline, I am suggesting that increased

diversity and cooperative interaction within our regional microcosm may result in increased biological productivity and organizational stability.

J. Frank McCormick
Professor and Director
Graduate Program in Ecology
The University of Tennessee

Kentucky Academy of Science Foundation For Botanical Research in Kentucky

The KAS Foundation for Botanical Research is now receiving applications for grants to be awarded for 1979-80. It is anticipated that \$500 will be available to support student research. Deadline for receipt of applications is October 1, 1979.

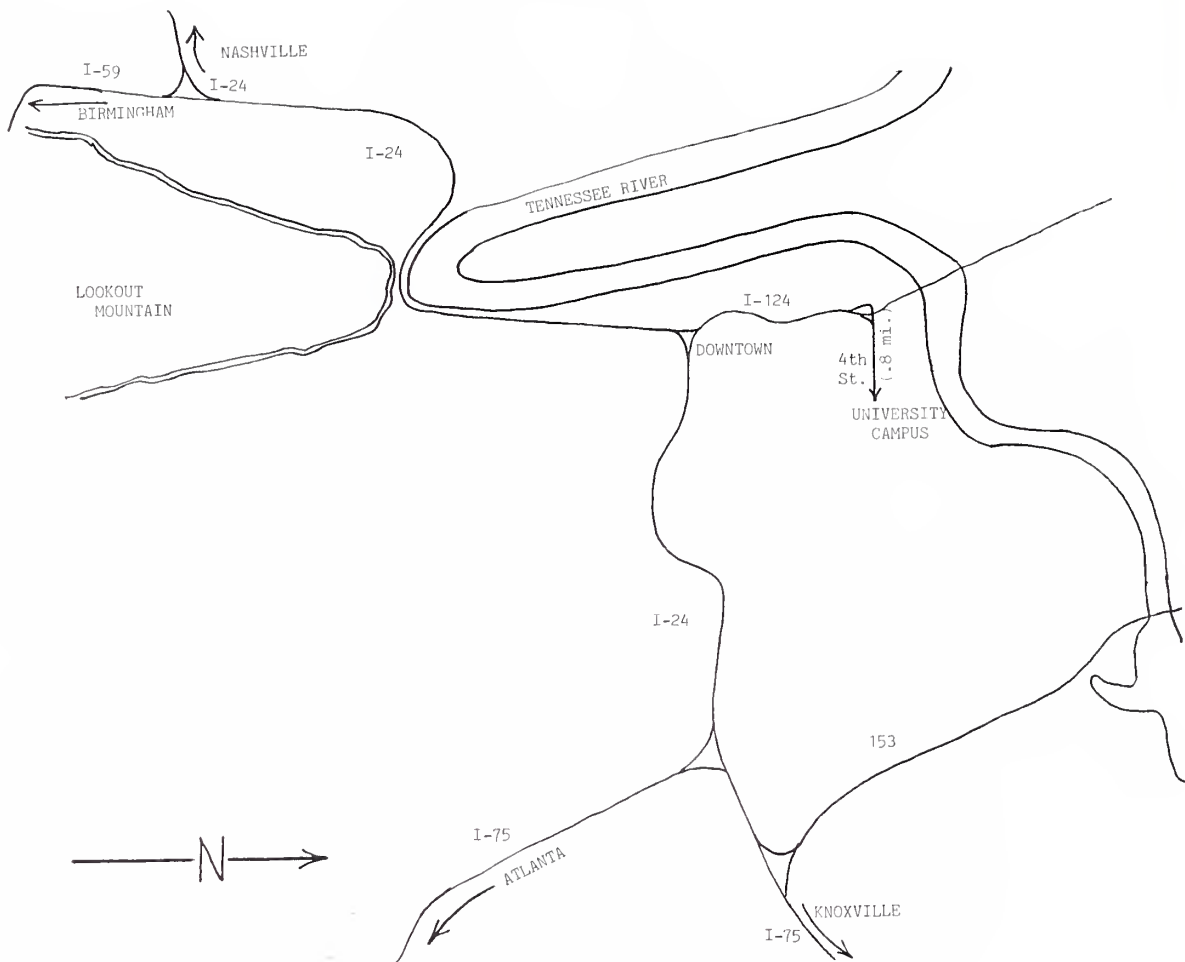
Grants are open to applicants enrolled in a college or university program within the Commonwealth, or applicants may be students enrolled in institutions of higher learning located outside the political boundaries of Kentucky if the individual's research program involves a study that would be conducted primarily within the State. Grant applications must involve research projects within the generally accepted boundaries of the field of botany. As a general outline this encompasses: Plant Taxonomy or Systematic

Botany, Plant Ecology, Plant Genetics, Plant Anatomy, Plant Morphology, Plant Cytology, Phycology, Mycology, Plant Physiology and Paleobotany.

Applications should include a brief description of the proposed research, references to appropriate literature and an outline of anticipated costs. Research projects are expected to be completed within a two year period from initiation of funding, and the applicant will be expected to present a summary of his/her results before an appropriate sectional meeting of the Kentucky Academy of Science.

Completed applications or inquiries should be sent to: Dr. Joe E. Winstead; Department of Biology; Western Kentucky University; Bowling Green, KY 42101.

NOTES



79.86

QH301
.A78
*

The ASB

BULLETIN

Volume 26, Number 3

(ISSN 0001-2386)

July 1979



Cassia occidentalis L.

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. Gary E. Dillard, Editor, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, Ms. 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pa. 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

GARY E. DILLARD
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J.C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — James W. Hardin, NC State University, Raleigh, NC 27650
Retiring President — Raymond O. Flagg, Carolina Biological Supply Co., Burlington, NC 27215
President Elect — Franklin F. Flint, Randolph-Macon Woman's College, Lynchburg, VA 24504
Vice-President — Frank McCormick, University of Tennessee, Knoxville, TN 37916
Secretary — Carol C. Baskin, University of Kentucky, Lexington, KY 40506
Treasurer — J. C. O'Kelley, University of Alabama, University, AL 35486
Archivist — Madeline P. Burbanck, Emory University, Atlanta, GA 30333
Executive Committee —
 Jon R. Fortman (1980), Mississippi University for Women
 George M. Simmons, Jr. (1980), VPI & SU
 Linda M. Stroud (1981), East Carolina University
 James L. Riopel (1981), University of Virginia
 Samuel B. Jones, Jr. (1982), University of Georgia
 George S. Ramseur (1982), University of the South
AAAS Representative, Section G — Lafayette Frederick, Howard University
AIBS Representative — James W. Hardin

CONTENTS

Association Affairs	119
Gant and Clebsch: Research Award	119
Odum: Teaching Award	119
ASB Editorship	119
1979-80 Officers	119
1979 Exhibitors	120
Travel Awards for Graduate Students	121
Treasurer's Report	121
James S. McDaniel (1933-1978)	122
Bertram W. Wells (1884-1978)	123
Systematic and Ecological Research Index	124
Brimleyana, A New Natural History Journal	125
News of Biology in the Southeast	126
ASB Bulletin Index, Volumes 21-25	Insert

COVER

A 2-nucleate female gametophyte of *Cassia occidentalis* L. as observed with Zeiss WL Nomarski interference optics in an optical sagittal section of an intact ovule cleared in Benzyl Benzoate-4½ clearing fluid and mounted permanently on a slide. The focal plane shown is 12 FANS (fine adjustment nuclear sets) deep; i.e., beneath approximately 12 cell layers. Courtesy of John M. Herr, Jr., University of South Carolina.

TIME AND PLACE OF FUTURE MEETINGS

1980	March 26-29	University of South Florida, Tampa
1981	April 8-10	University of Tennessee, Knoxville
1982		Eastern Kentucky University, Richmond
1983		University of Southwestern Louisiana, Lafayette

PATRONS

Carolina Biological Supply Company; Burlington, NC
 Parco Scientific Company; Vienna, OH
 Fisher Scientific Company; Chicago, IL
 Olinkraft, Incorporated; West Monroe, LA

COPY DEADLINES

October Issue: August 15
 January Issue: November 15
 April Issue: January 1
 July Issue: May 15

ASSOCIATION AFFAIRS

1979 Research Award Gant And Clebsch Repeat

The 1979 ASB Research Award, sponsored by **Carolina Biological Supply Company**, was won by Robert E. Gant and Edward E. C. Clebsch of the University of Tennessee, Knoxville, for their paper entitled "The Role of Allelopathic Interference in the Maintenance of Southern Appalachian Heath Balds." Drs. Gant and Clebsch were recipients of the 1972 Research Award for their paper entitled "The Allelopathic Influence of *Sassafras albidum* on Old Field Succession."

Odum Recipient Of 1979 Meritorious Teaching Award

One of America's leading ecologists, Eugene P. Odum, Alumni Foundation Distinguished Professor of Zoology and Director of the Institute of Ecology at the University of Georgia, received the Association's 1979 Meritorious Teaching Award.

ASB Editorship To Be Vacated

The editorship of the **ASB Bulletin** will be vacant effective at the conclusion of next year's annual meeting. The new editor will assume responsibility starting with the July, 1980, Issue of the **Bulletin**.

Individuals who wish to be considered for appointment as Editor are requested to submit a statement of interest and resume to *Dr. James W. Hardin, Department of Botany, NC State University, Raleigh, NC 27650*, by **October 1, 1979**.

ASSOCIATION OF SOUTHEASTERN BIOLOGISTS: 1979-1980 OFFICERS, COMMITTEES, AND REPRESENTATIVES

PRESIDENT — James W. Hardin, North Carolina State University, Raleigh, NC 27650

PRESIDENT ELECT — Franklin F. Flint, Randolph-Macon Woman's College, Lynchburg, VA 24504

VICE PRESIDENT — Frank McCormick, University of Tennessee, Knoxville, TN 37916

RETIRING PRESIDENT — Raymond O. Flagg, Carolina Biological Supply Company, Burlington, NC 27215

SECRETARY — (1982) Carol C. Baskin, University of Kentucky, Lexington, KY 40506

TREASURER — (1980) Joseph C. O'Kelley, University of Alabama, University, AL 35486

EXECUTIVE COMMITTEE MEMBERS-AT-LARGE — (1980) Jon R. Fortman, Mississippi University for Women, Columbus, MS 39701; (1980) George M. Simmons, Jr., Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; (1981) Linda M.

Stroud, East Carolina University, Greenville, NC 27834; (1981) James L. Riopel, University of Virginia, Charlottesville, VA 22903; (1982) Samuel B. Jones, Jr., University of Georgia, Athens, GA 30602; (1982) George S. Ramseur, University of the South, Sewanee, TN 37375

AUDITING COMMITTEE — (1980) Chairman: Robert R. Haynes, University of Alabama, University, AL 35486; Harriet E. Smith, University of Alabama; Joseph F. Scheiring, University of Alabama

CONSERVATION COMMITTEE — (1980) Chairman: J. Whitfield Gibbons, Savannah River Ecology Laboratory, Aiken, SC 29801; (1981) Arthur L. Buikema, Jr., Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; (1982) William H. Martin, Eastern Kentucky University, Richmond, KY 40475

LOCAL ARRANGEMENTS AND PROGRAM COMMITTEE — (1980) Chairman: Fred Eilers, University of South Florida, Tampa, FL 33620

MERITORIOUS TEACHING AWARD COMMITTEE — (1980) Chairman: Margaret Gilbert, Florida Southern College, Lakeland, FL 33802; (1981) Rudolph Prins, Western Kentucky University, Bowling Green, KY 42101; (1982) James L. Riopel, University of Virginia, Charlottesville, VA 22903

NOMINATING COMMITTEE — (1980) Chairman: Madeline P. Burbank, Emory University, Atlanta, GA 30322; John E. Cooper, N. C. State Museum of Natural History, Raleigh, NC 27611; Mary C. Dunn, Middle Tennessee State University, Murfreesboro, TN 37132

PAST PRESIDENTS' COUNCIL — (1980) Chairman: Raymond O. Flagg, Carolina Biological Supply Company, Burlington, NC 27215

PLACE OF MEETING COMMITTEE — (1980) Chairman: Ardis L. Cramer, 1431 Cornell Rd., NE, Atlanta, GA 30306; (1981) Linda M. Stroud, East Carolina University, Greenville, NC 27834; (1982) Samuel B. Jones, Jr., University of Georgia, Athens, GA 30602

PRIORITIES IN PUBLIC AFFAIRS COMMITTEE — John R. Bozeman, Georgia Department of Natural Resources, Box 1097, Brunswick, GA 31520; Stanwyn

G. Shetler, Botany, Smithsonian Institution, Washington, DC 20560

RESEARCH AWARD COMMITTEE — (1980) Chairman: Charles E. Jenner, University of North Carolina, Chapel Hill, NC 27514; (1981) J. Kenneth Shull, Jr., Loyola University, New Orleans, LA 70118; (1982) George S. Ramseur, University of the South, Sewanee, TN 37375

RESOLUTIONS COMMITTEE — (1980) Chairman: Raymond O. Flagg, Carolina Biological Supply Company, Burlington, NC 27215; Clinton J. Dawes, University of South Florida, Tampa, FL 33620

TRAVEL AWARD COMMITTEE — (1980) Chairman: John D. Reynolds, Virginia Commonwealth University, Richmond, VA 23220; (1981) Diane T. Wagner-Werner, University of South Florida, Tampa, FL 33620; (1982) Robert L. Beckmann, North Carolina State University, Raleigh, NC 27650

EDITOR, ASB BULLETIN — Gary E. Dillard, Western Kentucky University, Bowling Green, KY 42101

EDITOR, NEWS AND NOTES — Jon R. Fortman, Mississippi University for Women, Columbus, MS 39701

ARCHIVIST — Madeline P. Burbank, Emory University, Atlanta, GA 30322

AAAS REPRESENTATIVE (Section G) — Lafayette Frederick, Howard University, Washington, DC 20059

AIBS REPRESENTATIVE — James W. Hardin, North Carolina State University, Raleigh, NC 27650

ASB EXHIBITORS — 1979

Addison-Wesley Publishing Company

American Optical Corp. — SID

Bausch and Lomb

Wm. C. Brown Co., Pub.

Carolina Biological Supply Company (**Patron**)

Frank M. Carryl Company

Electron Microscopy Sciences

Fisher Scientific (**Patron**)

Forestry Suppliers, Inc.

General Supply Corp.

Hunter Publishing Company

JEOL U.S.A., Inc.

Macmillan Science — Turtox/Cambosco

Martin Instrument Company

NARCO Bio-systems

PARCO Scientific Co. (**Patron**)

Porter Instrument Service, Inc.

Preiser Scientific Inc.

Sargent-Welch Scientific Company

Southern Biological Supply Co.

Technology Diversified, Inc.

Vashaw Scientific, Inc.

Ward's Natural Science Establishment, Inc.

Worth Publishers, Inc.

TRAVEL AWARDS FOR GRADUATE STUDENTS

In accordance with a practice established in 1957, there will be limited funds available to defray partially the expenses of graduate students attending the 1980 Annual Meeting in Tampa. **The awards are for maintenance (lodging and meals) only.** Departments are urged to provide transportation allowances for their graduate students or to arrange for them to travel in vehicles with staff members. Preference will be given to graduate students giving papers at the Annual Meeting.

The guidelines for application follow:

1. Give a conservative, itemized estimate of meeting expenses **excluding transportation.**
2. Give information as to whether a paper is being presented by the applicant.
3. In a paragraph, give a brief history of your education to date; indicate how many years you have been — and plan to be — in graduate school, your major field or fields of interest, publications which have appeared or are in preparation, and any other pertinent professional details.
4. Give your source(s) of support while in graduate school, e.g., GI Bill, NSF, NIH, Teaching Assistantship, etc.
5. Have your major professor or departmental chairman provide a letter supporting your application.

Applications and supporting materials, in **triplicate**, must be received by *Dr. John D. Reynolds, Department of Biology, Virginia Commonwealth University, Richmond, VA 23220* by **January 1, 1980.** Applicants will be notified of the decision of the Travel Award Committee as soon as possible.

THE ASSOCIATION OF SOUTHEASTERN BIOLOGISTS TREASURER'S REPORT

January 1, 1978 – December 31, 1978

I. SAVINGS ACCOUNT

Balance — 1 Jan.	\$3,000.00		
Interest	217.50	\$ 3,217.50	
To Checking		217.50	\$ 3,000.00
TOTAL SAVINGS			<u>\$3,000.00</u>

II. CHECKING ACCOUNT

Balance — 1 Jan.		4,023.16	
Receipts			
Regular Dues/Subscriptions	9,507.00		
Patron Dues	300.00		
Business Affiliate Dues	250.00		
Reprints	471.00		
Back Issues	79.00		
Annual Mtg. (Tuscaloosa)	2,530.52		
Postage Reimbursement	3.21		
Meritorious Teaching Award (SP)	500.00		
From Savings	217.50		
TOTAL RECEIPTS		13,858.23	
TOTAL RECEIPTS & BEGINNING			
BALANCE			17,881.84

Disbursements

Membership & Publishing

Production/Mailing/Roll

Maintenance	3,007.28	
ASB Bulletin (Vol. 25)	6,652.00	
Certificates of Service	25.75	9,685.03

Office Expenses

Treasurer	140.72	
President	59.29	
Editor	69.75	269.76

Travel & Related Expenses

Interim Mtg., Atlanta	514.88	
AIBS Representative	146.00	
Student Travel Awards	950.00	1,610.88

Meritorious Teaching Award	500.00	
AIBS Adherent Dues	750.00	

TOTAL DISBURSEMENTS 12,815.67

BALANCE IN CHECKING — 31 Dec. 78 5,066.17

TOTAL ASSETS — 31 Dec. 78 8,006.17

Respectfully submitted,

(Signed) J. C. O'KELLEY

J. C. O'KELLEY, *Treasurer*

JAMES S. McDANIEL

1933 - 1978

Dr. James S. McDaniel, Chairman of the Department of Biology at East Carolina University, died suddenly on November 26, 1978. Dr. McDaniel, born in 1933 in Pittsburg, Kansas, was a graduate of Kansas State College of Pittsburg, Kansas, and received his master's and doctoral degrees from the University of Oklahoma. He did post-doctoral work at Rice University. Dr. McDaniel joined the faculty of East Carolina University in 1967 and became Chairman of the Department of Biology in 1975. Dr. McDaniel had been a member of the ASB since 1968 and belonged to other professional organizations including Sigma Xi and the American Society of Parasitologists. He served as vice-president of the Southeastern Society of Parasitology in 1972-73. He was recently elected editor of *BIOS*. His research interests included the ecology, physiology, and biochemistry of helminth parasites. Dr. McDaniel's wife, Susan, is Assistant Vice Chancellor for Academic Affairs at East Carolina University and a member of the faculty of the Department of Biology.



The ASB Bulletin

Volumes 21-25
1974-1978



Published by
The Association of Southeastern Biologists, Inc.
GARY E. DILLARD, EDITOR

Index to Volumes 21-25, 1974-1978

This is the fifth of a series of five-year indices planned for the *ASB Bulletin*. The author index has been omitted for Volumes 21-25, and the subject index does not include abstract titles. Those who plan to bind the *Bulletin* should note that this index and title page can be removed and bound with Volume 25 without disturbing the sequence of pages in this issue.

Subject Index

Abstracts

Abstracts of papers presented at the ASB annual meeting in:	
1973 Bowling Green (late abstracts)	21:15
1974 Savannah	21:35
1975 Blacksburg	22:38
1976 New Orleans	23:39
1977 Raleigh	24:34
1978 Tuscaloosa	25:32

Articles

An Inventory of Rare and Endangered Species for the Southeast. — C. E. Styron	22:3
The ASB Gavel. — Perry Holt	24:111
The Birth, Development and Objectives of the Association of Systematics Collection. — J. C. Dickinson	21:123
The Burbank Presidencies and the Distaff Side	25:102
Conservation Committee Report	25:118
The Ecology of Animal Domestication. — I. Lehr Brisbin, Jr.	21:3
Executive Committee Actions	25:118
The Functions of Coastal Wetlands. — Armando A. De La Cruz	23:179
Groundwater Biology Symposium	25:109
The Horse is Stolen. — David J. Cotter	22:99
IUCN Meeting	25:12
Kentucky Academy of Science Foundation for Botanical Research in Kentucky	25:134
Molds, Mildews, and Millennia. — Leland Shanor	21:103
Mountain Lake Biological Station Summer Courses, 1975	22:95
Mountain Lake Summer Courses	21:94
Necrology Resolution Savannah Meeting	21:116
Necrology	24:118
Necrology	25:117
News or Conservation in the Southeast	24:7
Passenger Pigeon Memorial Fund Announced at Cincinnati Zoo	21:126
Proposed Changes to the Constitution and By-Laws	22:12

Regional Associations: Filling A Need. — David J. Cotter and Grover C. Miller	21:113
Revised Edition: National List of Scientific Plant Names	25:134
SREB Invites Application for Small Grants	25:134
SREL Symposium	24:7
SREL Symposium	24:98
SREL Symposium	25:109
Succession Symposium Terrestrial Ecosystems	25:6
Summer Fellowships — Mountain Lake Biological Station	21:125
Symposium on Rare, Endangered and Threatened Biota of the Southeast	23:137
A Review of Endangered Species Act of 1973	23:138
The Endangered and Threatened Plant Program of the U. S. Fish and Wildlife Service	23:141
Computerized Information Systems for Threatened and Endangered Species	23:144
Biogeographic Information System for Animal Species in the Southeastern United States	23:149
The Tennessee Heritage Program: An Applied Data Management Systems for Endangered and Threatened Species Information	23:155
Report on the Work of the Florida Committee on Rare and Endangered Plants and Animals	23:159
The Red River Gorge Controversy in Kentucky: A Case Study in Preserving a Natural Area	23:163
Toward an Ecological Ethic. — Wes Jackson	23:123
Trumbull Appointed Executive Director of AIBS	22:18
Update on Wes Jackson	24:114

Departments

Association affairs:	21:2, 21:3, 21:102, 21:122, 21:132, 22:2, 22:98, 22:118, 23:6, 23:168, 23:178, 24:99, 24:115, 25:115, 25:127.
Books and periodicals:	21:109, 23:13.
News of biology in the southeast:	21:11, 21:95, 21:119, 21:128, 22:14, 22:94, 22:111, 22:119, 23:10, 23:116, 23:133, 23:189, 24:9, 24:104, 24:112, 24:128, 25:7, 25:106, 25:120, 25:130.

Errata:	21:15
----------------	-------

Meetings: ASB

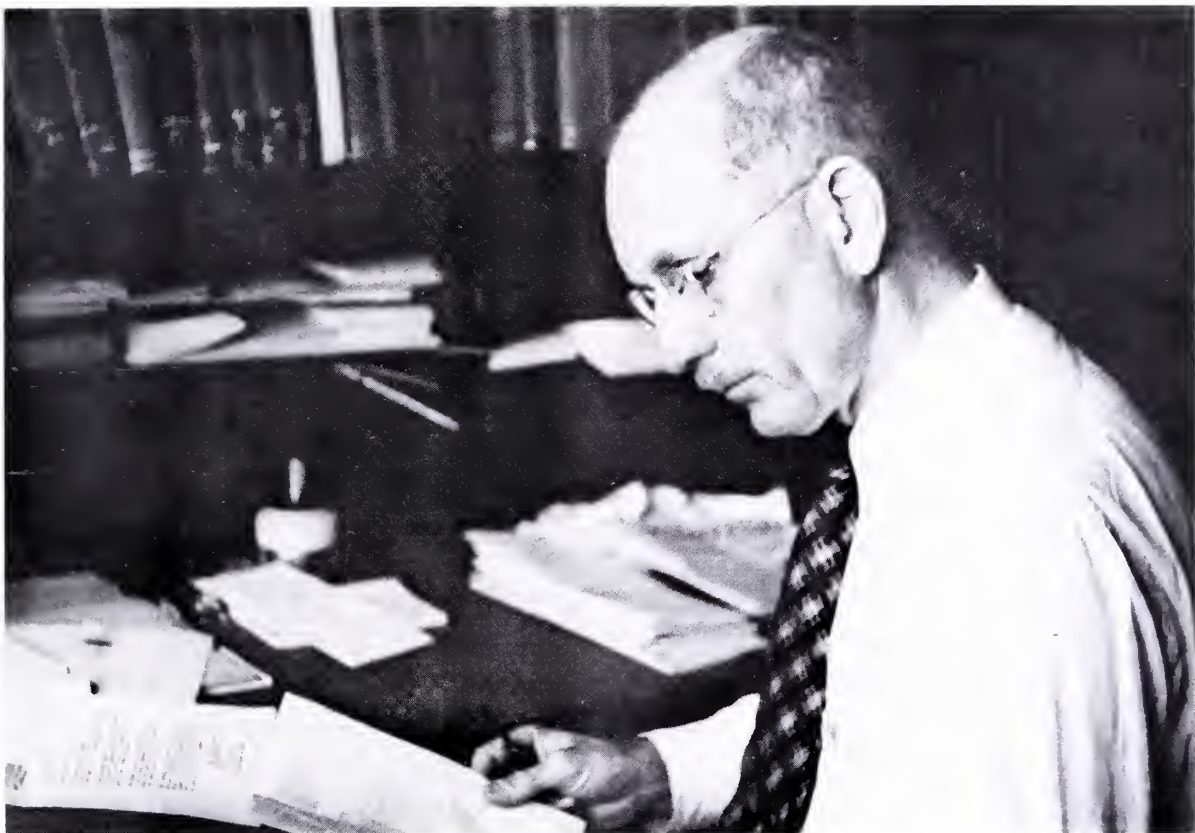
About the meetings:	
Savannah, 1974	21:9
Blacksburg, 1975	22:5
New Orleans, 1976	23:3
Raleigh, 1977	24:3
Tuscaloosa, 1978	25:3

Program of the:		Mullahy, S. J., Fr. John H.	25:129
35th annual meeting, Savannah, 1974	21:19	Totten, Henry Roland	21:115
36th annual meeting, Blacksburg, 1975	22:23	Wolf, Frederick Adolph	23:172
37th annual meeting, New Orleans, 1976	23:19		
38th annual meeting, Raleigh, 1977	24:15	Reprint announcement:	21:15
39th annual meeting, Tuscaloosa, 1978	25:15		
Meritorious Teaching Awards			
Grace Thomas, 1974	21:109	Hazel Roach and Paul A. Delcourt, 1974	21:116
L. M. Outten, 1975	22:106	David C. Lagrew, Jr. and Jerry M. Baskin, 1975	22:107
Jonathan J. Westfall, 1976	23:170	V. M. Norton and K. B. Davis, 1976	23:174
Margaret L. Gilbert, 1977	24:116	B. P. Howard and W. B. Keith, 1977	24:116
Albert E. Radford, 1978	25:116	Walter S. Flory, Jr., 1978	25:115
Obituaries			
Byrd, Elon Eugene	21:127	Treasurer's Report	
Cocke, Elton Cromwell	23:9	1974	21:117
Hesler, Leremuel Ray	25:107	1975	22:109
Hess, Margaret N.	24:118	1976	23:169
Jones, Edmund Ruffin	24:127	1977	24:117
		1978	25:101



BERTRAM WHITTIER WELLS

1884 - 1978



The death of Bertram Whittier Wells on December 29, 1978, marked the passing of North Carolina's first plant ecologist and the last of the United States' first generation of plant ecologists. His contributions derived from the teaching of several generations of students at North Carolina State College, from his original research on the vegetation of North Carolina, and from his remarkable ability to popularize botany and ecology effectively and accurately, are great and stand as an enduring testimonial to a vital and fascinating man.

B. W. Wells was born on March 5, 1884, in Troy, Ohio, the son of a Methodist minister. He attended schools in Ohio and was graduated from Ohio State University in 1911. After brief teaching assignments at Knox College and Connecticut and Kansas Agricultural Colleges, he obtained his M.A. degree from Ohio State in 1916 and his Ph.D. from the University of Chicago in 1917. Although his doctoral research involved studies on insect galls in plants, a field in which he was a major authority, he came into contact with Henry Chandler Cowles and the other early plant ecologists at Chicago. It was there that he acquired an interest in ecology, the field in which he was to make his greatest contributions. After a year at the University of Arkansas, Wells came to North Carolina State College in 1919 as head of the Department of Botany and Plant Pathology. He held that position until his retirement in 1949.

Wells is perhaps best remembered for his effective and dynamic teaching of ecology. He taught literally thousands of students and is remembered by them with fondness and respect. They particularly remember his annual field trips to the southeastern coastal plain and the Carolina Beach area. Wells' vigor, enthusiasm, and dynamic character, combined with a unique ability to explain natural phenomena, made these trips exciting experiences. The fact that he could out-last any of his students at the Saturday night street dances at Carolina Beach added a dimension to his reputation that few professors can achieve.

Wells' research in ecology, presented in nearly 30 publications from 1910 to the mid-1950's, is the work of an energetic and thoughtful mind. He was a careful interpreter of the landscape. His interpretations of natural vegetation were made as a result of personal field work, much of which was done on foot in some of the most remote parts of North Carolina. Wells was no stranger to hard physical work and much of his research reflects that fact. Although he did not carry out any extensive experimental work, he had an ability to use experimentation in carefully conceived ways to assist in the development of an explanation of field observations.

His first publication upon reaching North Carolina, released in 1924, was a synopsis of the major plant communities of the State. It was characteristic of the man

that he was able, within a short period of time, to see enough of the State to generalize about its vegetation with reasonable accuracy. For the next twenty years his research, much of which was done with Ivan D. Shunk, his colleague in the Department of Botany, was concentrated in the Coastal Plain and eastern Piedmont. Major studies of the savannah, long-leaf pine, and pocosin vegetation types and of old-field succession were completed. These studies emphasized the importance of soil factors and fire as determinants of vegetation patterns. In studies conducted near Ft. Fisher, Wells and Shunk showed with simple experiments that the sheared appearance of the coastal trees and shrubs found there was due to wind-driven salt spray and not to the wind itself. This theory withstood direct experimental efforts to refute it and has now become well accepted. In the late 1930's, Wells turned his attention to the mountain grass balds, seeking an explanation for these enigmatic patches of grass in an otherwise forested area. After countless hours spent tramping mountain trails and peaks, he concluded that these balds were Indian summer camp sites and that they owed their existence to primitive man's activity. About this time, Wells also became interested in the Carolina Bays and concluded, as did some others, that these curious elliptical depressions were best explained as the result of the impacts of meteorites on soft Coastal Plain sands. Although history has smiled more kindly on his theory for the origin of balds than on his theory for the origin of Carolina Bays, his stout defense of both controversial hypotheses in several publications and oral presentations is pure, vintage B. W. Wells.

In some ways, Wells' greatest contribution was his *Natural Gardens of North Carolina* published with the assistance of the North Carolina Garden Club in 1932. This book presented a discussion of the major vegetation types of the State, their ecology, and keys to identifica-

tion of the important species found in them. The writing, though not scientific, was accurate and caught the reader's interest and imagination. Original copies of the *Gardens* are collector's items and it has fortunately been reprinted.

Wells was active in professional societies, particularly in the southeast. He was past president of the Southern Appalachian Botanical Club and of the North Carolina Academy of Science.

Wells spent his retirement years with his second wife, Maude, on his farm nestled in a bend of the Neuse River in northern Wake County. His mind remained active, and he was always willing and eager to discuss his view points and other ideas. Much of his time was consumed with painting, an avocation he renewed upon retirement. His paintings range over a variety of subjects, from nudes to landscapes. A Wells' painting is a possession prized by any of his associates. He and Maude lived a quiet and comfortable life. In fact, much of the serenity of Wells' last years can be attributed to the steadfast companionship and support provided by Maude.

Wells' passing marks the end of an era. He was the last of North Carolina's natural history ecologists, whose research involved observation and interpretation of the landscape. His theories were derived from careful observation of the landscape. It is unimportant that some of his theories were incorrect. What is important is that he attempted to explain what he saw to scientist and non-scientist alike. North Carolina is much the richer for Wells' many and varied contributions. We will not be privileged to know another man like him.

Arthur W. Cooper
Department of Forestry
North Carolina State University

Index of Current Plant Systematic and Ecological Research in the Southeastern United States

At the April, 1979, ASB meeting, the Southeastern Section of the Botanical Society of America and the Southern Appalachian Botanical Club voted to implement a clearinghouse of research projects. This clearinghouse will overlap, in part, the recent announcement of the Hunt Institute International Register. However, the intent of the Southeastern Index is to include the M.S., Ph.D., and Professional projects involving the Southeast so that one source of inquiry will be available. A 4 × 6 index card will be used to record the information for each project. We hope the Index will assist in choosing research projects, reducing duplication, increasing communication, and fostering cooperation. We expect to mail a supply of cards to each institution late in the summer, to be ready for the fall. If your institution has a new advanced degree program or you would like to inquire about the Index, please contact: **Dr. James F. Matthews; Department of Biology; UNC/Charlotte; Charlotte, NC 28223.**

Announcing A New Natural History Journal —

BRIMLEYANA

A new journal devoted to reporting studies on the natural history of the Southeastern United States has been initiated by the North Carolina Museum of Natural History under the editorship of **Dr. John E. Cooper.**

Contents

Number 1; March, 1979

- COOPER, JOHN E. The brothers Brimley: North Carolina naturalists.
- ASHTON, RAY E., JR. AND ALVIN L. BRASWELL. Nest and larvae of the Neuse River Waterdog, *Necturus lewisi* (Brimley) (Amphibia:Proteidae).
- HOLT, PERRY C. AND ANN M. WEIGL. A new species of *Xironodrilus* Ellis 1918 from North Carolina (Clitellata: Branchiobdellida).
- HIGHTON, RICHARD. A new cryptic species of salamander of the genus *Plethodon* from the Southeastern United States (Amphibia:Plethodontidae).
- IVERSON, JOHN B. The female reproductive cycle in north Florida *Kinosternon baurii* (Testudines:Kinosternidae).
- HOCUTT, CHARLES H., ROBERT F. DENONCOURT AND JAY R. STAUFFER, JR. Fishes of the Gauley River, West Virginia.
- McKINLEY, DANIEL. Review of the Carolina Parakeet in the Carolinas.
- TARPLEE, WILLIAM H., JR. Estimates of fish populations in two northeastern North Carolina swamp streams.
- BROWN, E. E. Some snake food records from the Carolinas.
- BLANEY, RICHARD M. The status of the Outer Banks Kingsnake, *Lampropeltis getulus stricticeps* (Reptilia:Serpentes: Colubridae).
- SHELLEY, ROWLAND M., ALVIN L. BRASWELL AND DAVID L. STEPHAN. Notes on the natural history of the terrestrial leech, *Haemopsis septagon* Sawyer and Shelley (Gnathobdella:Hirudinidae).
- BRASWELL, ALVIN L. AND NORA A. MURDOCK. New records of the salamanders *Ambystoma talpoideum* (Holbrook) and *Hemidactylium scutatum* (Schlegel) in North Carolina (Amphibia:Ambystomatidae and Plethodontidae).
- WILLIAMS, JAMES D. AND WILLIAM M. HOWELL. An albino sculpin from a cave in the New River drainage of West Virginia (Pisces:Cottidae).
- SHELLEY, ROWLAND M. AND MARIANNE FILKA. Occurrence of the milliped *Pachydesmus crassicutis incursus* Chamberlin in the Kings Mountain region of North Carolina and the Coastal Plain of South Carolina (Polydesmida: Xystodesmidae).

Address all requests for information on purchase and exchange to the Managing Editor, Brimleyana; NC State Museum of Natural History; P.O. Box 27647; Raleigh, NC 27611. Manuscripts and all other correspondence should be addressed to the Editor at the same address.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — James Wilkes, Troy State University

Florida — Vacant

Georgia — Fred K. Parrish, Georgia State University

Illinois — George T. Weaver, Southern Illinois University

Kentucky — Joe E. Winstead, Western Kentucky University

Louisiana — Harry J. Bennett, Louisiana State University

Maryland — Don Windler, Towson State University

Mississippi — Bruce Lacey, Mississippi University for Women

North Carolina — Vacant

South Carolina — G. Thomas Riggins, Jr., Newberry College

Tennessee — John R. Freeman, University of Tennessee at Chattanooga

Virginia — Jean Pugh, Christopher Newport College

West Virginia — Roy B. Clarkson, West Virginia University

JON R. FORTMAN — *News Editor*

Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

About People

The University of Alabama, Huntsville. Recent promotions in Biology are: **P. S. Campbell** from Assistant to Associate Professor, **R. C. Leonard** from Associate Professor to Professor.

Auburn University, Department of Botany and Microbiology. **Donald E. Davis**, Professor of Weed Science, was elected vice-president of the National Weed Science Society of America for 1979-80. **Gerald R. Wilt**, Associate Professor of Bacteriology, was elected the outstanding teacher in the School of Agriculture for 1978-79. **Curt M. Peterson**, Associate Professor of Botany, has been granted a Professional Improvement Leave for July 1, 1979 to June 30, 1980, at Pendleton, or to study cooperatively with USDA scientists the reproductive physiology of wheat. **James A. Lyle**, Professor and Department Head, will retire on September 30, 1979, after 32 years of continuous service at Auburn University with the last 25 as Department Head. During his tenure as Head, the department has grown from 11 staff members, including one graduate student, and no undergraduate majors, to 83 staff members, including 28 graduate students and 80 undergraduate majors. **Sarah E. Rowe**, senior student in microbiology, has been nominated as Auburn University's candidate for a national Phi Kappa Phi graduate fellowship. **Ms. Rowe** will graduate in June and has taken all course work at Auburn University with a grade-point average of 2.99 (A=3.00). **Willard T. Blevins**, Associate Professor of Microbiology, has been awarded a Water Resources Research Institute grant on "Factors Affecting Floc Formation and Bulking in the Activated Sludge Process for Treatment of Textile Wastewaters."

Spelman College, Biology Department. **Dr. Barnett Smith** will retire as Professor Emeritus from the Department in May, 1979. **Dr. Smith** has served in the Department for 35 years.

Louisiana State University, Department of Botany. **Dr. David J. Longstreth** has been appointed Assistant Professor in plant physiology. **Dr. Longstreth** completed his doctoral studies at Duke University under the direction of **Dr. B. R. Strain** and is currently a NSF Postdoctoral Scholar at the University of California at Los Angeles where he is working with **Dr. Park S. Nobel** on photosynthetic adaptations of desert plants to environmental stress.

The University of Southwestern Louisiana, Department of Biology. Recent additions to the faculty are **Dr. W. Ross Ellington**, Assistant Professor, from the University of Vermont and **Dr. Sydney P. Craig III**, Associate Professor, from the University of South Carolina. **Dr. Ellington** has received a grant from the American Philosophical Society for the study of metabolism of sea anemones at low oxygen levels and a NSF grant to fund travel to the Bermuda Biological Station for the study of collagenases in sea cucumbers. **Dr. Courtney Hackney** has received a grant from the Mississippi Marine Research Council for a study of the ecology and distribution of *Neritina reclivata*.

Delta State University, Department of Biological Sciences. **Dr. Jesse Steven White** has announced his retirement, effective May 15, 1979, from the faculty of Delta State University after 40 years of instructional activity in the State of Mississippi.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. **Drs. Thomas and Julia Lytle** hosted a scientific laboratory equipment exhibition at the GCRL on February 22, 1979. The Atlanta branch of Fisher Scientific sponsored the program. The exhibit featured not only the latest in lab equipment but also a series of lectures on various research-related topics. A team of marine biologists from GCRL, with the assistance of the commercial fishing vessel "Sue Ann" recently began tagging red drum off the Mississippi coast. These fish are tagged with either yellow or green anchor tags, inserted on the lower rear side of the stomach. **Dr. Thomas McIlwain**, assistant director of fisheries research and management at the Lab, said they hope to be able, with the assistance of the sport and commercial fishing industry, to tag several thousand fish during 1979. "Ultimately, data and information to be obtained through tag studies will be used to plan for conservation and management, when necessary, of the fishery stocks," said **McIlwain**.

Drs. David Cook and Edwin Cake, heads of the Microbiology and Oyster Biology sections are associate investigators on a project which has been funded by Sea Grant. The project is entitled "A Viral Evaluation of Prohibited Oyster Growing Waters in Mississippi." **Dr. R. D. Eilender, Jr.**, Assistant Professor of microbiology at the University of Southern Mississippi, is the principal investigator. The GCRL has received a grant from the Mississippi-Alabama Sea Grant Consortium for **Dr. Edwin W. Cake** to assist with an economic assess-

ment of a proposed oyster depuration facility. **Cake** will serve as a consultant to **Dr. D. C. Williams**, an economist, in developing guidelines for the proposed on-shore depuration facility. The GCRL is initiating a pollutant study of Mississippi Sound and adjacent river systems. This work will help document the quality of coastal waters and the forms and manner in which pollutants are transported. **Drs. Thomas F. and Julia S. Lytle**, who head the Analytical and Environmental Chemistry Sections, respectively, are the principal investigators. **Mr. Charles K. Eleuterius** is the principal investigator of a study supported by the Mississippi Mineral Resources Institute for the development of a master plan for research related to mineral resources in the marine environment. **Mr. Eleuterius**, assisted by **Mrs. Sherree Beaugez**, is the principal investigator of a Sea Grant to continue development of a hydrographical-meteorological atlas for Mississippi Sound. **Dr. Sally Richardson**, associate ichthyologist, began conducting a Sea Grant project entitled "The Role of the Mississippi Sound in Recruitment to Sport and Commercial Fish Stocks."

North Carolina State University, Botany Department. **Dr. Wendy Boss** has accepted the plant physiology position. She will teach undergraduate plant physiology. Her research interests are membrane fusion and transport. **Dr. Henry Amerson** is the project leader of a tissue culture, disease resistance laboratory program concerned with conifer propagation technology. The new laboratory facility was completed during the spring 1979 semester. It was supported by several private paper companies and operates in cooperation with the Department of Forestry at North Carolina State University.

North Carolina State University, Department of Zoology. New appointments are: **Dr. David Demont**, Assistant Professor, who will be conducting research on freshwater fisheries and providing extension services in the area of fisheries. **Dr. Robert Grossfeld**, Assistant Professor, who will teach in the area of physiology and will conduct research on axonal transport systems. Two Professors of Zoology died unexpectedly during the year: **Dr. Reinard Harkema**, a noted parasitologist, and **Dr. Bernard Martof**, a noted herpetologist. Several grants were received by the department. Among these are: **Dr. Herbert Underwood** received a Career Development Award from the National Institutes of Health and a grant entitled "Circadian Rhythms, Thermoregulation and Photoperiodism" from NSF. **Dr. J. Mal Whitsett** received a grant entitled "Behavioral Aspects of Sexual Maturation" from NSF. The department has also initiated an extensive series of studies on endangered species in North Carolina such as the American alligator and the red-cockaded woodpecker with support from the North Carolina Wildlife Resources Commission.

Elon College, Department of Biology. Elon College has recently announced the **Thomas E. Powell, Jr.**, Professorship of Biology. **Dr. Maurice Whittinghill** will be the first occupant of this new professorship beginning in September.

University of South Carolina, Department of Biology. The following faculty have been awarded research grants: **Dr. Patricia J. DeCoursey**, Slocum Lunz Foundation, for "Strategy for Survival: Tidal Timing of Egg-Hatching in *Uca*." **Dr. Steven N. Handel**, NSF, for "Measurement of Pollen Flow in Experimental and Natural Plant Populations." **Drs. Aubrey Thompson and Roger Sawyer**, National Cancer Institute, for "Hormonal Effects Upon the Proliferation of Malignant Lymphocytes" and **Dr. Aubrey Thompson**, NSF, for "Undergraduate Research Participation."

Presbyterian College, Department of Biology. **John M. Henson** has joined the faculty as an Instructor of

Cell Biology, Microbiology, and General Biology. **Mr. Henson** received his B.S. from the University of South Carolina and M.S. from Clemson University with specialization in Microbiology.

University of Tennessee, Knoxville, Botany Department. **Dr. James D. Caponetti**, Associate Professor of Botany, has been elected President of the Tennessee Academy of Science for 1979. **Rosemarie Wahnbaeck-Spencer** has won a \$150 cash prize award for best scientific paper presentation at the annual meeting of the Southern Section of the American Society of Plant Physiologists. **Ms. Wahnbaeck-Spencer** is a graduate student in the Department of Botany and, through a cooperative arrangement, she is supported by the University's Institute of Agriculture at the Comparative Animal Laboratory in Oak Ridge. **Dr. A. J. Sharp** was awarded honorary membership by the Tennessee Native Plant Society at its annual meeting and banquet at Gatlinburg, Tennessee. The society honored **Dr. Sharp** "for his long, effective and enthusiastic participation in public education on Tennessee's native flora."

Roanoke College, Biology Department. **Dr. William J. Matthews** has accepted an appointment as a Research Associate and Assistant Professor at the University of Oklahoma Biological Station, Kingston, Oklahoma.

Virginia Military Institute, Department of Biology. **Dr. Howard A. Schneider**, retired director of the Nutrition Research Institute of the University of North Carolina at Chapel Hill is serving as the second Wachtmeister Scholar in the Sciences and Engineering at VMI for the current semester. He is affiliated with the Biology Department and is teaching a course in "Contemporary Issues in Human Nutrition" and setting up an intra-class symposium on the World Food Problem designated as Rome II — modelled after the earlier international discussion on Human Nutrition held in Rome, Italy. **Dr. Schneider** is also presenting a series of evening lectures on "Politics in Nutrition" which is open to the general public.

West Virginia University, Department of Biology. **Martin W. Schein** replaced **John DeCosta** as Chairman of the Department as of April 1979. **Robert Allen** and **Roy B. Clarkson** are Associate Chairmen.

Agnes Scott College, Department of Biology. **Dr. John Pilger** will join the staff as Assistant Professor in September, 1979. **Dr. Pilger** received his Ph.D. from the University of Southern California. He is presently a Smithsonian Postdoctoral Fellow at the Institution's Fort Pierce Bureau, Fort Pierce, Florida. **Dr. Sandra Bowden** has been named Chairman of the Biology Department at Agnes Scott College to begin her duties in September, 1979.

Emory University, Department of Biology. Recent appointments are: **Dr. Donald L. Phillips**, plant ecologist, Ph.D., Utah State University. **Dr. Paul R. Lennard**, Ph.D., Washington University, has held a postdoctoral position for the past two years at Stanford University. His field is neurobiology. **Dr. Robert B. Devlin**, a developmental biologist, received his Ph.D. from the University of Virginia and for the past three years has been a postdoctoral fellow at the University of Virginia.

Mississippi University for Women, Department of Biological Sciences. **Dr. Jon R. Fortman**, Professor of Biology, has recently been elected by the National Association of Biology Teachers as a Regional Director for Mississippi, Alabama, Louisiana, Georgia, Florida and Puerto Rico.

University of Virginia, Charlottesville, Department of Biology. **Dr. Gene Block**, Assistant Professor of Biology, has been appointed to the faculty. His research interest is in biological rhythms.

Virginia Polytechnic Institute and State University, Department of Biology. New appointments for the de-

partment include: **Dr. James M. Conroy**, Assistant Professor of Microbiology, Postdoctoral at Cornell University Medical School; **Dr. Robert E. Kramp**, Assistant Professor of Zoology, Postdoctoral at Vanderbilt University Medical School; **Dr. Brent D. Opell**, Assistant Professor of Zoology, from the Museum of Comparative Zoology, Harvard University; **Dr. Barbara B. Turner**, Assistant Professor of Zoology, Postdoctoral, University of Michigan Medical School; **Dr. Bruce J. Turner**, Assistant Professor of Zoology, Postdoctoral, Museum of Natural History, University of Michigan. The following faculty have retired and have been appointed to Professor Emeritus: **Dr. Perry C. Holt**, Professor of Zoology, invertebrate zoology, and **Dr. Robert D. Ross**, Professor of Zoology, ichthyology.

Lynchburg College, Department of Biology. **Dr. James E. Carico**, Professor of Biology, was awarded a grant to conduct field investigations on the spider genus *Dolomedes* in New Zealand. The grant is sponsored by the U.S.A.-New Zealand Cooperative Science Program of the National Science Foundation.

About Institutions

Tulane University, Biology Department. The Biology Department has developed an Environmental Studies program in which a student majors in a social or natural science and selects from a "core" of supplementary subjects (including several ecology courses) to supply those aspects of the environment missing in his/her major.

Francis Marion College, Department of Biology. The National Science Foundation has awarded a grant of \$5,200 to Francis Marion College for a three-week course in marine biology for school teachers under the direction of **Dr. Tom Roop**.

Washington and Lee University, Department of Biology. Washington and Lee University has recently agreed to participate in a cooperative program with the School of Forestry and Environmental Studies at Duke University. Students participating in the program will spend three years studying at Washington and Lee and two years at Duke. Upon completion of the program students will receive a B.A. or B.S. from Washington and Lee and a Master's Degree in Forestry from Duke University.



59.06

QH301
.A78
*

The ASB

BULLETIN

Volume 26, Number 4

(ISSN 0001-2386)

October 1979



Solenopsis invicta

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. Gary E. Dillard, Editor, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, Ms. 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pa. 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, Al. 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

GARY E. DILLARD
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J.C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — James W. Hardin, NC State University, Raleigh, NC 27650

Retiring President — Raymond O. Flagg, Carolina Biological Supply Co., Burlington, NC 27215

President Elect — Franklin F. Flint, Randolph-Macon Woman's College, Lynchburg, VA 24504

Vice-President — Frank McCormick, University of Tennessee, Knoxville, TN 37916

Secretary — Carol C. Baskin, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Emory University, Atlanta, GA 30333

Executive Committee —
Jon R. Fortman (1980), Mississippi University for Women

George M. Simmons, Jr. (1980), VPI & SU

Linda M. Stroud (1981), East Carolina University

James L. Roppel (1981), University of Virginia

Samuel B. Jones, Jr. (1982), University of Georgia

George S. Ramseur (1982), University of the South

AAAS Representative, Section G — Lafayette Frederick, Howard University

AIBS Representative — James W. Hardin

CONTENTS

ASSOCIATION AFFAIRS	131
Forty-first Annual Meeting	131
Deadlines	131
Meritorious Teaching Nominations	131
Association Research Prize ..	132
Nominating Committee, Request for Suggestions	132
Graduate Student Travel Awards	132
Change of Dates for 1980 Meeting	133
Letter from Local Arrangements, 1980	133
Accommodations — USF Area	134
NEWS OF BIOLOGY IN THE SOUTHEAST	136
REVIEW — Biology in the Blue Ridge	139

COVER

Scanning electron micrograph of a fire ant, *Solenopsis invicta*. This neotropical ant has escaped and become a serious pest in several southern states. Courtesy of Roger Boettcher, Louisiana State University.

TIME AND PLACE OF FUTURE MEETINGS

1980	March 26-29	University of South Florida, Tampa
1981	April 8-10	University of Tennessee, Knoxville
1982		Eastern Kentucky University, Richmond
1983		University of Southwestern Louisiana, Lafayette

PATRONS

Carolina Biological Supply Company; Burlington, NC
Parco Scientific Company; Vienna, OH
Fisher Scientific Company; Chicago, IL
Olinkraft, Incorporated; West Monroe, LA

COPY DEADLINES

January Issue: November 15

April Issue: January 1

July Issue: May 15

October Issue: August 15

ASSOCIATION AFFAIRS

FORTY-FIRST ANNUAL MEETING AT THE UNIVERSITY OF SOUTH FLORIDA TAMPA, FLORIDA 26-29 March, 1980

In preparing for the 1980 Annual Meeting, please note the following deadlines. Members can facilitate arrangements for the meeting by sending all requested material as far in advance of the deadlines as possible. Because time available for preparation of the program and publication of abstracts is already at a minimum, it is absolutely necessary for the Program Committee and Editor to adhere strictly to the deadlines in order for the programs and April Bulletin to be ready in time for the meeting. **LATE ABSTRACTS AND OTHER MATERIALS CANNOT BE ACCEPTED.** Please remind your secretary and yourself that all material intended for the printer must be neatly typed, double-spaced throughout (this means title, author(s), institutional affiliation(s), text, footnotes, *everything*). Poorly prepared material will be returned to the sender!

DEADLINES

November 15 — Receipt of material to appear in the January Bulletin.

November 15 — Suggestions for nominations for ASB officers and executive committee members (See Call for Papers for detailed instructions).

December 1 — Receipt of titles and abstracts of papers to be presented at the Tampa Meeting (See Call for Papers for detailed instructions).

January 1 — Applications for Travel Awards to Graduate Students (see July 1979 ASB Bulletin).

January 1 — Receipt of material to appear in the April Bulletin (other than abstracts).

January 15 — Nominations for the Meritorious Award for Teaching (see below).

January 15 — Papers to be considered for the Association Research Prize (see below).

MERITORIOUS TEACHING AWARD NOMINATIONS

For the twenty-ninth time, an ASB member will be recognized for especially meritorious

teaching at the March 1980, Annual Meeting. The regulations governing the award are as follows:

The recipient must be a member of ASB in good standing. He or she should have taught biology in a southern institution for at least ten years and must be currently teaching. He or she must not be a dean or have regular administrative duties beyond the departmental level. Among evidences of the qualifications of the candidate are the progress of the candidate as indicated by recognition in his or her institution (important assignments and other contributions specifically related to effective teaching) and the number and quality of students for whom he or she provided the primary inspiration to continue in biology, especially those who later received advanced degrees.

Members are urged to nominate outstanding teachers for this award. Nominations are kept on file from year to year; those who do not receive the award when they are first nominated are reconsidered by the Committee in subsequent years. Nominations and supporting documentation should be sent to *Dr. Margaret Gilbert; Flor-*

ASSOCIATION RESEARCH PRIZE

If you intend to present a paper at the Tampa meeting, you are invited to submit your manuscript in competition for the Association of Southeastern Biologists Research Award. The Award, a handsome medallion, is sponsored by the **Carolina Biological Supply Company**, Burlington, North Carolina.

Rules of the competition are as follows:

1. The Research Award is given annually for an especially meritorious paper actually presented by the author(s) at the Annual Meeting. **If the paper is not presented, it will be disqualified.**

2. Only members are eligible to submit papers in competition for the Award. This applies to **all** names on the paper.

3. Papers submitted in competition may be in press but must not have been published prior to the previous Annual Meeting.

4. Papers are judged by eminent scientists selected by the Committee from institutions outside the Southeast. Every effort is made by the Committee to keep the authors of submitted papers anonymous. Criteria for the Award are left to the discretion of the judges who may withhold the Award if no paper is deemed to have sufficient merit.

5. Papers must be submitted **in triplicate** and in their entirety no later than January 15, 1980, to *Dr. Charles Jenner; Zoology Department; UNC-Chapel Hill; Chapel Hill, NC 27514.*

Announcement of the winner of the Research Award will be made at the Annual Meeting. The original copy of the award-winning paper will be sent to the sponsor of the prize.

NOMINATIONS

The Nominating Committee would welcome suggestions from the membership in selecting nominees for offices and executive committee positions. The following positions will be filled at the Tampa Annual Meeting: **President-Elect**, **Vice-President**, and two seats on the **Executive Committee**. The Call for Papers will include a form for this purpose to be sent to *Dr. Madeline P. Burbanck; Department of Biology; Emory University; Atlanta, GA 30322* by November 15, 1979.

TRAVEL AWARDS FOR GRADUATE STUDENTS

In accordance with a practice established in 1957, there will be limited funds available to defray partially the expenses of graduate students attending the 1980 Annual Meeting in Tampa. **The awards are for maintenance (lodging and meals) only.** Departments are urged to provide transportation allowances for their graduate students or to arrange for them to travel in vehicles with staff members. Preference will be given to graduate students giving papers at the Annual Meeting.

The guidelines for application follow:

1. Give a conservative, itemized estimate of meeting expenses **excluding transportation.**
2. Give information as to whether a paper is being presented by the applicant.
3. In a paragraph, give a brief history of your education to date; indicate how many years you have been — and plan to be — in graduate school, your major field or fields of interest, publications which have appeared or are in preparation, and any other pertinent professional details.
4. Give your source(s) of support while in graduate school, e.g., GI Bill, NSF, NIH, Teaching Assistants'ip, etc.
5. Have your major professor or departmental chairman provide a letter supporting your application.

Applications and supporting materials, in **triplicate**, must be received by *Dr. John D. Reynolds, Department of Biology, Virginia Commonwealth University, Richmond, VA 23220* by **January 1, 1980**. Applicants will be notified of the decision of the Travel Award Committee as soon as possible.



Change of Dates For 1980 ASB Meeting

March 26-29

In early July, Dr. Fred Eilers, Chairman of Local Arrangements for the 1980 meetings at the University of South Florida, informed me of various difficulties — mainly lack of space — in planning for the meetings for April 23-26 as originally scheduled. He could not be guaranteed rooms of the right sizes for all the paper sessions, and they would have to be scattered over the campus requiring a 10-12 min. walk between sessions. We both agreed that this would be horrible. There were then three alternatives: first, try for one or more hotels in downtown Tampa; second, find another host institution; and third, change the dates so the University of South Florida could handle it. Dr. Eilers looked into the first alternative and there were no hotels that could adequately accommodate the meetings during the last week of April, plus the cost for hotel rooms would be too much for most of us, and particularly students. The second and third alternatives are possible under the Constitution (Art. V, Sect. 2) which gives the Executive Committee the power to change the time and place of the annual meeting, in case of an emergency. This was an emergency! I felt that July 10 was really too late to start searching for a brand new host institution and enthusiastic local arrangements committee. But, if we could change the date to the end of March, then the University of South Florida campus could handle everything with no more than the usual problems. A quick poll of the Executive Committee gave the OK — so, the dates have been changed. Mark your calendar now! March 26-29, 1980.

The new dates will be better in many respects, but also cause some problems. First the advantages. It will be between quarters at the University of South Florida, so the meetings can be close together and in the most ideal rooms. The Florida Academy meetings will be there the first part of that week and some members might stay on for ASB. The new date will not be the last week of classes for some of us (as it would have been) and it will not conflict with the Wildflower Pilgrimage in the Smokies (hooray on both counts!). The motel costs near campus will be lower than in downtown Tampa. And, March in Florida will be great.

Now for the problems. Moving the date up one month makes it impossible to get the April ASB Bulletin to the members prior to the meeting. Changing the "call for papers" deadline to Nov. 1 would be hard on many and still may not accomplish an earlier publication date. So, in consultation with Editor Gary Dillard, we have decided to keep the old deadline and the April issue with the abstracts will come out in April as usual, but after the meetings. The Local Arrangements Committee will notify speakers of the time of their papers, by post card, in late February or early March, and a program will be available at registration. The information on nominees for offices will also be in the registration packet. The only real problem I see with this is that members will not be able to look over the program early enough to decide whether to go to the meetings. Go ahead and plan now to go — the program will be great!

If these new dates cause a major problem that we have overlooked, please let me know so it can be considered for future years. See you in Florida — March 26-29.

James W. Hardin
President

A Letter From Local Arrangements University Of South Florida, Tampa

Dear Colleagues:

Next spring we hope you will join us in attending the Annual Meeting of ASB on the campus of the University of South Florida in Tampa. The meeting dates are **March 26-29, 1980**, which coincide with our spring break. Consequently, we will have the campus to ourselves.

We think you will find both USF and the surrounding Florida area pleasant and interesting, providing for an enjoyable time. We would like to take this opportunity to mention a few items which will be important in making your plans. Please note that while the University will be on break, the dorms will still be occupied. This will require the use of the surrounding motels for lodging. We have compiled a list of the motels and campgrounds in the vicinity which is printed elsewhere in the Bulletin. In selecting lodging, keep in mind that only two motels are within easy walking distance of the meeting area. Also, spring is typically a peak tourist season with the motels and campgrounds operating at 100% occupancy. Consequently, we urge you to make your reservation as early as possible to insure your preferred accommodations. It will be your responsibility to make housing reservations directly with the motel or campground. If there are special considerations or questions concerning housing, please contact Dr. John Romeo, Department of Biology, USF, Tampa, FL 33620 (813) 974-2392.

USF is basically a commuter University located just northeast of Tampa and easily accessible via I-75. The automobile is the preferred method of transportation in Tampa. For all practical considerations, there is no public transportation. Those who choose to drive will find that Tampa and central Florida have many interesting restaurants and attractions, albeit, at a distance.

We have scheduled two pre- and two post-meeting field trips. The trips on Wednesday, March 26, will be to Sarasota to visit the Marie Selby Botanical Gardens and the Allyn Entomological Museum and to a marine station at Cockroach Bay which is just south of Tampa. Selby Botanical Gardens is famous for its collection of epiphytes and the Allyn Entomological Museum specializes in Lepidoptera. Cockroach Bay, despite its name, is an unpolluted marine area which features good mangrove swamps.

The trips on Saturday, March 29, will be to the Archibold Biological Station and Highlands Hammock State Park both near Sebring and to the phosphate fossil areas near Bartow. The Biological Station features good examples of the vegetation types of the south and of the Lake Wales ridge; the State Park provides excellent hardwood hammocks and cypress swamps. The Bartow phosphate areas contain mainly marine fossils ranging from shark's teeth to manatee ribs.

We mention these field outings at this early date simply because of the tight housing situation you will encounter in the spring. If any of these trips appeal, we suggest that you plan for them in your motel reservation. You can always shorten your stay; it is doubtful that you will be able to lengthen it.

We hope that these two idiosyncrasies of the area — housing and transportation — will pose no difficulties for you, and we look forward to seeing you in the spring.

Stewart L. Swihart
Professor & Chairperson
Frederick I. Eilers
Chairperson, Local Arrangements
Committee

ACCOMMODATIONS — USF AREA

Motels

I. Less than one mile

*Stones Travel Lodge
2501 E. Fowler Avenue
Tampa, FL 33612

(813) 971-3900
Single or Double \$45.00
Shuttle van to USF

†Holiday Inn	(813) 971-4710
2701 E. Fowler Avenue	Single — \$26.50
Tampa, FL 33612	(2 people) — \$31.80 (1 bed)
	Double — \$36.00 (2 double beds)

II. One to two miles

†Interchange Motor Lodge	(813) 933-6531
109 E. Fowler Avenue	Single — \$19.88
Tampa, FL 33612	Double — \$24.88

Econo-Travel Motor Hotel	1-800-446-6900
11414 Central Avenue	Single — \$16.95
Tampa, FL 33612	(1 bed) — \$19.95 (2 people)
	Double — \$22.95 (2 beds)
	Each additional person \$3.00

Howard Johnsons	(813) 971-5150
720 E. Fowler Avenue	Single — \$33-37.00
Tampa, FL 33612	Double — \$38-45.00

Days Inn	1-800-241-9191
2901 E. Busch Blvd.	Single — \$24.88
Tampa, FL 33617	Double — \$28.88
	Each additional person \$3.00

III. More than two miles

Royal Plaza Motor Inn	(813) 988-9191
4139 E. Busch Blvd.	Single or Double \$39.00
Tampa, FL 33617	Each additional person \$4.00

Busch Junction	(813) 933-7681
1701 E. Busch Blvd.	Double — \$35-40.00
Tampa, FL 33612	

Days Inn	1-800-432-1177
701 E. Fletcher Avenue	Single — \$18.88
Tampa, FL 33612	Each additional person \$3.00

*Ramada Inn	(813) 933-4011
820 E. Busch Blvd.	Single — \$34.00
Tampa, FL 33612	Double — \$42.00

Holiday Inn Tampa North	(813) 961-1000
400 E. Bearss Avenue	Single or Double — \$39-44.00
Tampa, FL 33612	

Campgrounds

Busch Gardens Travel Park 10001 Malcolm McKinley Dr. Tampa, FL 33612	(813) 971-0008 (3/4 mile) Per night \$7.80 (5 people only) Each additional \$0.50
Happy Traveler Campground, Inc. Box 290A East Fowler Avenue Thonotosassa, FL 33592	(813) 986-3094 (6 miles) Per night \$7.00
A. Spanish Main Campgrounds U.S. Highway 301 North Thonotosassa, FL 33592	(813) 986-2415 (7½ miles) Per night \$7.00
Quail Run Campground 500 Pasco Road Zephyr Hills, FL 33599	(813) 949-3711 (16 miles) Per night \$7.00 (2 people)
Hillsborough River State Park U.S. Highway 301 North Box 250L — Rt. 4 Zephyr Hills, FL 33599	(813) 981-1020 (18 miles) Per night (no electricity) \$4.16 (electricity) \$5.20

All motels require reservations and a deposit or major credit card number. Reservations should be made 3 months in advance.

All campgrounds require reservations and a deposit. Reservations should be made by *November*.

* = Airport Pickup

† = Probable rate increase by March 1980

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — James Wilkes, Troy State University	Maryland — Don Windler, Towson State University	Virginia — Jean Pugh, Christopher Newport College
Florida — Vacant	Mississippi — Bruce Lacey, Mississippi University for Women	West Virginia — Roy B. Clarkson, West Virginia University
Georgia — Fred K. Parrish, Georgia State University	North Carolina — Vacant	
Illinois — George T. Weaver, Southern Illinois University	South Carolina — G. Thomas Riggan, Jr., Newberry College	
Kentucky — Joe E. Winstead, Western Kentucky University	Tennessee — John R. Freeman, University of Tennessee at Chattanooga	
Louisiana — Harry J. Bennett, Louisiana State University		

JON R. FORTMAN — *News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

About People

Samford University, Biology Department. **Dr. W. Mike Howell** was recently appointed as Head of the Biology Department, replacing **Dr. Herbert A. McCullough**, who led the department from 1957 to 1979.

Dr. McCullough is now devoting the majority of his time to teaching and putting the finishing touches on his forthcoming textbook in Botany. **Dr. Fred Cox** has joined the department from the University of Alabama in Birmingham. He will be teaching basic Human Anat-

omy and Physiology for nursing, pharmacy, and biology majors. His research interests center around reproductive biology of turtles. **Dr. John Albert Fincher**, who recently retired as President of Carson-Newman College, has returned to join the Biology Department faculty and his first love, that of teaching biology.

University of Alabama, Tuscaloosa, Department of Biology. **Dr. Ronald Hood** has received a grant from the National Institute of Occupational Safety and Health to study the "Toxicology of Prenatally Administered Arsenic." **Dr. Ronald Lindahl** has received a grant from the National Cancer Institute to study "Gene-Enzyme Relationships of Normal and Abnormal Liver Aldehyde Dehydrogenases." For "Studies on the Comparative Physiology of Hibernation (Cold Torpor) in Freshwater Turtles," **Dr. Gordon Utsch** has been awarded a grant from the National Science Foundation. **Dr. Robert B. Haynes** has been elected to a three year term as Chairman of the Southeastern Section of the Botanical Society of America. After eleven years of service to the department, **Dr. Louis Williams** retired effective January 1, 1979. **Dr. Steven Harris**, formerly a Post-Doc in the Department, has been appointed temporary Assistant Professor. **Dr. Harris** will teach General Biology and Limnology.

University of North Alabama, Department of Biology. **Dr. Jack H. Moore** is the new Head of the Department of Biology. **Dr. Jack S. Brown** has returned to full-time teaching and research.

Troy State University, Department of Biological Sciences. **Dr. D. C. Widdowson**, retired Professor of Biology, died June 29, 1979. **Dr. Widdowson** was instrumental in developing the Medical Technology and Environmental Science Programs at Troy State. **Phillip Ryals** was appointed as an Instructor of Biology. He received his B.S. from Troy State and M.S. from the University of Alabama. **Mrs. Pearl Wilkes** retired as an Instructor of Biology in June.

Auburn University, Department of Botany and Microbiology. **Dr. R. Forney**, Graduate Research Assistant, was awarded second prize at the 5th annual graduate student research paper competition for presentation of "Atrazine Toxicity to Submerged Macrophytes of Chesapeake Bay" at the 1979 meeting of the Aquatic Plant Management Society at Chattanooga, Tennessee. **C. M. Peterson**, Associate Professor, is on a professional improvement leave from July 1, 1979 to June 30, 1980, at the Columbia Plateau Conservation Research Center, Pendleton, Oregon. He will conduct cooperative research at that location with USDA scientists on the reproductive physiology of wheat. The Food and Agricultural Organization of the United Nations sponsored the visit of four Uruguayan scientists to confer with research faculty about the sclerotium rot problem in peanuts and other agronomic crops. **Takashi Matsushima**, Japanese hypomycologist and author of 2 books on the Fungi Imperfecti, is on a 3-month study tour with **Dr. G. Morgan-Jones** of the department. He resides in Kobe City, Japan, as a taxonomic mycologist for the Shionogi Research Laboratory, Shionogi and Co., Ltd. **U. L. Diener**, Professor, served as nationwide chairman of a task force for the Council of Agricultural Science and Technology on Mycotoxins of Food and Feed Grains.

Florida State Museum, Department of Natural Sciences. **Dr. Charles A. Woods** has been appointed Chairman of the Department of Natural Sciences and Curator of Mammals at the Florida State Museum where he begins work on July 1, 1979. **Dr. Woods** brings to the University of Florida campus his extensive expertise in Caribbean biology and a special interest in the systematics and functional morphology of hystricomorph

rodents. He is currently pursuing NSF-supported studies of insectivores and rodents in the Dominican Republic. **Dr. Woods** is jointly appointed to the faculty of the Zoology Department of the University of Florida where he will teach the fall course in Mammalogy. He and his family are moving from Burlington, Vermont.

Rollins College, Biology Department. **Dr. Eileen Gregory** has been appointed to the faculty as an Assistant Professor. **Dr. Gregory** comes from the University of Washington where she recently received the doctorate in Immunology and Microbiology. **Drs. David I. Richard** and **James W. Small** have received a grant from the Florida Department of Natural Resources for a study of the effect of introduced white amur and herbicides on Central Florida lake ecosystems.

Florida State University, Department of Biological Sciences. **Dr. L. Raymond Fox**, who has been with the Department for nine years has accepted the Department Chairman position at Wichita State University. **Dr. Malcolm Potts**, a graduate of the University of Durham (England) has been appointed as Research Associate to work with **Dr. E. I. Friedmann** on microbial ecology of the Antarctic dry valleys. **Dr. Dan Simberloff**, Professor, recently visited the following: University of Sydney and Scripps Institution of Oceanography where he presented a seminar, "Biogeographic Distributions and Competition: What's the Null Hypothesis?"; the University of Auckland, "Missing Species Combination — So What?"; and the University of Hawaii, "Experiments with Islands and their Animal Communities." **Dr. John Elam**, Associate Professor, is now Director of the Psychobiology Program. He succeeds **Dr. Lloyd Beidler**, who was Director of the program for several years. **Dr. Robert Livingston**, Associate Professor, visited Townsville, Queensland, Australia, in May. He attended meetings, delivered lectures, and assisted in planning coastal research at the invitation of the Australian government.

Agnes Scott College, Biology Department. **Dr. John F. Pilger** has been appointed Assistant Professor of Biology. **Dr. Pilger** was a Smithsonian postdoctoral fellow at the Smithsonian Institution, Ft. Pierce Bureau. **Dr. Nancy P. Groseclose**, formerly Chairman of the Biology Department and Dana Professor of Biology has retired, and **Dr. Sandra T. Bowden** has been named chairman.

Emory University, Department of Biology. Recent appointments are: **Dr. Donald L. Phillips**, plant ecologist (Ph.D., Utah State University); **Dr. Paul R. Lennard**, neurobiologist (Ph.D., Washington University) who has held a postdoctoral position for the past two years at Stanford University; and **Dr. Robert B. Devlin**, developmental biologist (Ph.D., University of Virginia) who has been a postdoctoral fellow at the University of Virginia for the past three years.

Southern Illinois University, Department of Forestry. **Mr. Rob Brown**, formerly of the Department of Forestry, has been appointed Hydrologist with the Water Resource Division, U.S. Geological Survey, Carson City, Nevada, where his responsibilities include monitoring water quality at a low-radioactive burial site.

Northeast Louisiana University, Biology Department. The following research grants have been awarded: **Lawrence Baum**, "Scanning Electron Microscope Examination of Exfoliated Urothelial Cells"; **Charles Depoe**, "Ultrastructure of Pollen of Aquatic Plants"; **Melinda L. Kinkade**, "Precipitin Tests of Six Species of Mosquitoes Identified as Vectors of St. Louis Encephalitis"; **William W. Miller, III**, "Investigation of the Role of the Urinary Bladder Mucosa in Bacterial Infection Defense"; **Russell A. Normand**, "Environmental Factors Which Influence the Dual Infection of Tomato Plants by Viruses"; **B. L. Ricks**, "An Apparent Decrease in Resistance to Certain

Chlorinated Hydrocarbons in Three Fish Species"; **B. L. Ricks**, "Scanning Electron Microscope Comparisons of Mouthpart Anatomy of Three Species of Fire Ants, Genus *Solenopsis*"; and **R. Dale Thomas**, "Checklist of the Vascular Flora of Washington and St. Tammany Parishes."

Mississippi University for Women, Department of Biological Sciences. **Dr. James Murrell**, Associate Professor, has recently been appointed Dean of the Graduate School. **Dr. R. Bruce Lacey** was promoted from Associate Professor to Professor of Biology. **Dr. Jon R. Fortman** has been appointed a Biological Science Curriculum Study Consultant for the State of Mississippi by **William Mayer**, BSCS Director, Boulder, Colorado.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. **Dr. Lionel N. Eleuterius** is the principal investigator of a contract to provide the U.S. Army with technical assistance in conducting a military methodology test to evaluate the methods and environments used to test military equipment and materials. The experiment will help determine if items exposed in various tropic environments can be used to predict environmental effects on items exposed at sites within the continental United States. Three scientists from the laboratory attended the sixth Ocean Thermal Energy Conversion international conference held June 19-22 in Washington, D.C. Japan, France, and the United States were especially well represented among approximately 1000 people who attended. **Dr. Gordon Gunter**, Professor of Zoology and Director Emeritus, **Dr. A. Venkataramiah**, Head of the Physiology Section, and **John Steen**, Assistant Planktonologist, all attended the meeting since they are all engaged in studies related to OTEC.

University of North Carolina at Charlotte, Department of Biology. **Dr. Paul Goldstein**, Lecturer in Biology, is a new member of the faculty. He was a Research Associate at N.C. State University, Raleigh. **Susan F. Peters** has been appointed Assistant Professor of Biology. She will receive her doctorate in the Fall of 1979 from the University of California at Davis, where she is a graduate teaching assistant. **Dr. Mary Beth Thomas** comes from Wake Forest University as Professor of Biology. **Dr. Mary Jo Vesper** joins the staff as an Assistant Professor from a Post-doctoral research position at Ohio State University. **Dr. John A. Watts** has been appointed Assistant Professor of Biology. He formerly held a Post-doctoral fellowship at M. S. Hershey Medical Center in Hershey, Pennsylvania.

Warren Wilson College, Biology Department. **Dr. Malcolm Smith** has joined the department to teach genetics and microbiology. **Dr. Smith** received his Ph.D. from Washington University, St. Louis, in December, 1978.

Winthrop College, Biology Department. **Dr. Luckett V. Davis** announces the following appointments to the faculty: **Dr. L. Bruce Sherbine**, Ph.D., Pennsylvania State University, to Associate Dean of the College of Arts and Sciences and Associate Professor of Biology. He was formerly associated with Lycoming College. **Dr. Jeannette Runquist**, Ph.D., North Carolina State University, as Instructor of Biology. She was on the NCSU faculty during the 1978-79 academic year.

University of South Carolina, Department of Biology. New appointments as Assistant Professor are: **Dr. Michael J. Dewey** from the Institute for Cancer Research in Philadelphia; **Dr. Robert P. Lawther**, formerly of the Department of Medical Microbiology at the University of California, Irvine; and **Dr. Michael R. Stallcup** from the Department of Biochemistry and Biophysics, University of California, San Francisco. **Dr. Donald Brambilla** (Ph.D., University of Michigan) and **Dr. Leni A. Wilsmann** (Ph.D., Michigan State University) have been

appointed Visiting Assistant Professors. Faculty grants include: **Dr. A. H. C. Huang**, "Control of Peroxisomal Metabolism in Relation to Photorespiration," USDA; **Dr. E. A. Thompson**, "Undergraduate Research Participation," NSF; **Drs. E. A. Thompson and R. H. Sawyer**, "Hormonal Effects Upon the Proliferation of Malignant Thymocytes," NIH; and **Dr. Duane C. Yoch**, "Regulation of Nitrogenase Activity," NIH.

Middle Tennessee State University, Department of Biology. **Dr. Ellis S. Rucker, Jr.**, Professor of Biology, has retired after 33 years in the department as a botanist.

University of Tennessee, Botany Department. **Edward E. Schilling, Jr.** has been appointed an Assistant Professor. **Dr. Schilling** received the Ph.D. from Indiana University and is a taxonomist with research interests in the systematics of the genus, *Solanum*, and the evolution of weeds. He will come to the University of Tennessee, Knoxville, from a post-doctoral position at The University of Texas at Austin. **Karen W. Hughes** and **Raymond W. Holton** have received a two-year grant from the USDA Competitive Grants Program to isolate and characterize mutants of tobacco which are resistant to the dipyrilidium herbicides, Paraquat and Diquat. Mutant cells will be selected from cell suspension cultures. Plants regenerated from the resistant cells will be characterized genetically and a metabolic basis for the resistant phenotype will be determined where possible. **Patricia L. Walne**, Professor of Botany, has received a 3-year grant from NSF for continuing investigations on euglenoid flagellates.

Austin Peay State University, Biology Department. **James G. Vidrine** has been appointed Assistant Professor of Biology. He received the Ph.D. from Iowa State and has ten years research experience in virology and tissue culture. **Drs. Vidrine and R. H. McCoy** will serve as Education Coordinators for the new Clinical Microbiology Program. **Dr. F. Scott**, Principal Investigator, **Dr. W. Chester**, and **Dr. D. Snyder** have been awarded a grant from The Tennessee Heritage Program for "A Study of Selected Potential Natural Areas in The Lower Cumberland River Basin of Tennessee."

James Madison University, Department of Biology. **Norlyn L. Bodkin**, received his Ph.D. in systematic botany from the University of Maryland, College Park, at the Commencement exercises December 18, 1978. **Dr. Bodkin's** dissertation is entitled "A Revision of the North American *Melanthium*." **Margaret A. Gordon**, Assistant Professor, was awarded a grant from NSF for a two-day workshop on Women in Science Careers. The workshop was held on March 30-31 and addressed women at the freshman and sophomore levels from seven area colleges.

Virginia Commonwealth University, Department of Biology. **Walter L. Richards** has retired to Emeritus status. **Michael Roper**, **Robert Jenkins**, **Leo Montroy** and **Joseph Mitchell** have left the University while the following new staff members have been added: **Leonard Smock** (Ph.D., University of North Carolina); **Michael Fine** (Ph.D., Rhode Island); **Michael Weinstein** (Ph.D., Florida State); **Candace Jo Farnham** (Ph.D., University of Florida) and **Jimmy Lee** (Ph.D., SUNY-Stony Brook). A USDA grant to study *Azolla-Anabaena azollae* interactions has been received by **Robert Fisher** and **James Gates**.

Old Dominion University, Department of Biological Sciences. **Dr. Robert Rose** will be added to the faculty as Instructor of mammalogy and ornithology.

West Virginia University, Department of Biology. **Dr. Ronald E. Barry, Jr.** has been appointed as Lecturer for the academic year 1979-80. **Dr. Barry** received the Ph.D. in Zoology from the University of New

Hampshire and most recently taught in the Biology Department of Bates College, Lewiston, Maine.

Western Kentucky University, Department of Biology. Dr. Jeff H. Jenkins, Acting Head since January, 1978, was recently appointed Head of the Department. Dr. Rebecca H. Brown (Ph.D., Oklahoma State), whose major field of interest is molecular genetics, has joined the Department as an Assistant Professor.

About Institutions

Warren Wilson College. The Environmental Studies Department has received \$20,000 to be spent over a 5-year period to augment college funding for equipment and staff support.

University of North Carolina at Charlotte. The University of North Carolina again conducted a successful integrated marine biology program this past summer. The topics covered were marine developmental biology, marine microbiology, and marine physiology. Students met for lectures and carried out individual research projects at the marine laboratory. The program is open to both undergraduate and graduate students.

Gulf Coast Research Laboratory. Anadromous Fish project personnel have been successful in rearing and stocking striped bass fingerlings again this spring. The quarter-inch "stripers" were obtained from South Carolina and also from the Mississippi Game and Fish Commission, according to biologist Larry Nicholson. The project is in the final year of a 3-year program of rearing striped bass at the Laboratory. The primary objectives are the rearing and subsequent release of the fingerlings of South Carolina origin into the Biloxi Bay system and the release of striped bass from North Carolina and/or Virginia into the Bay of St. Louis. The affiliation of Eastern Kentucky University with the Gulf Coast Research Laboratory was approved by the Board of Trustees of Mississippi Institutions of Higher Learning in June.

Middle Tennessee State University. The Department of Biology became affiliated with the Gulf Coast Research Laboratory in Ocean Springs, Mississippi effective Summer, 1978. Marine biology courses may be taken at the Laboratory during the summer and credits transferred to MTSU.

Austin Peay State University. The Biology Department is developing a joint program in Nuclear Medicine Technology with the Radiology Department of Vanderbilt Medical Center. The first class began August 15th. Students successfully completing this clinical internship program will be awarded a B.S. Degree in Radiologic Technology.

Virginia Commonwealth University. New animal facility construction has been bid with construction beginning August, 1979. A new greenhouse is planned for construction during the fall and winter. Six laboratories are to be remodeled during the fall and winter.

Old Dominion University. Approximately 85 scientists participated in the Second International Symposium on Parasitic Weeds held on the NCSU campus July 16-19. Sponsors were: Old Dominion University, North Carolina State University, and USDA Animal and Plant Health Inspection Service. The four day meeting included sessions on ecology and floral biology, forest parasites, germination, morphology, anatomy, ultrastructure, physiology, development and control. Printed proceedings (196 pp. + 53 p. supplement) are available from: A. D. Worsham, Department of Crop Science, Box 5155, Raleigh, NC 27650. Cost is \$5.00. Make checks payable to N.C. State University.

Review

Biology in the Blue Ridge. Ralph M. Sargent. Highlands Biological Foundation, Inc., Highlands, N.C. XI plus 157 pp. Soft cover. 1977.

This volume vividly describes the objectives, work, and progress resulting from the first 50 years (1927-1977) of the existence of the Highlands Biological Station. It tells of the initiation of the Station, and of why the location is such an important one to the biology of the region. It documents the efforts which have resulted in the growth of the Station as a highly respected center for graduate and post-doctoral study and research in the Southern Appalachians. The projects which have been involved, and the research investigators concerned, are discussed. The over 350 research publications are listed which have resulted from work at the Station during its first 50 years of existence.

The Highlands Station is located at a crossroads for many taxa native to both the Southern and Northern Appalachians. The information outlined in the volume concerning progress with the solving of numerous biological problems fostered by the Station's location — make it an important component for the library of every eastern and southeastern biologist.

This history is written by a man who is an able ornithologist and a good field botanist. He has not only served as a Secretary, a President, and a long time Trustee of the Station but has known all but two officers who have served the institution. Professionally, the author is Gummere Professor of English, Emeritus, of Haverford College — which doubtless accounts for much of the lucidness and interest of the book.

This book is available from the Highlands Biological Station, Highlands, N.C. 28741, for \$5.50 per copy — which includes packing and postage when orders are accompanied by payment. **Walter S. Flory, Wake Forest University.**

U.S. POSTAL SERVICE STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 USC 3685)			
1. TITLE OF PUBLICATION The ASB Bulletin		2. PUBLICATION NO. 033220	
3. FREQUENCY OF ISSUE Quarterly (January, April, July and October)		4. DATE OF FILING 1 October 1979	
5. LOCATION OF KNOWN OFFICE OF PUBLICATION (Street, City, County, State and ZIP Code) (Not printer)		6. ANNUAL SUBSCRIPTION PRICE \$10.00	
7. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printer)		8. NO. OF ISSUES PUBLISHED ANNUALLY 4	
9. NAMES AND COMPLETE ADDRESSES OF PUBLISHER, EDITOR AND MANAGING EDITOR			
PUBLISHER (Name and Address) Academy of Natural Sciences, 19th and The Parkway, Philadelphia, PA 19103			
EDITOR (Name and Address) Gary Dillard, Dept. of Biology, Western Kentucky University, Bowling Green, KY 42101			
MANAGING EDITOR (Name and Address) None			
10. OWNER (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.)			
NAME Association of Southeastern Biologists, Inc.		ADDRESS Chapel Hill, NC (Dr. William J. Koch, Associate Professor, Dept. of Botany, University of North Carolina, Agent)	
11. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES (If there are none, so state)			
NAME None		ADDRESS	
12. FOR COMPLETION BY NONPROFIT ORGANIZATIONS AUTHORIZED TO MAIL AT SPECIAL RATES (Section 132.122, FPM)			
The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one)			
☒ HAVE NOT CHANGED DURING PRECEDING 12 MONTHS ☐ HAVE CHANGED DURING PRECEDING 12 MONTHS (If changed, publisher must submit explanation of change with this statement)			
13. EXTENT AND NATURE OF CIRCULATION		AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	
A. TOTAL NO. COPIES PRINTED (Net Press Run)		1575	
B. PAID CIRCULATION 1. SALES THROUGH DEALERS AND CARRIERS, STREET VENDORS AND COUNTER SALES		none	
2. MAIL SUBSCRIPTIONS		1650	
C. TOTAL PAID CIRCULATION (Sum of B1 and B2)		1650	
D. FREE DISTRIBUTION BY MAIL, CARRIER OR OTHER MEANS SAMPLES, COMPLIMENTARY, AND OTHER FREE COPIES		100	
E. TOTAL DISTRIBUTION (Sum of C and D)		1750	
F. COPIES NOT DISTRIBUTED 1. OFFICE USE, LEFT OVER, UNACCOUNTED, SPOILED AFTER PRINTING		75	
2. RETURNS FROM NEWS AGENTS		none	
G. TOTAL (Sum of E, F1 and F2—should equal net press run shown in A)		1575	
14. I certify that the statements made by me above are correct and complete.		SIGNATURE AND TITLE OF EDITOR, PUBLISHER, BUSINESS MANAGER, OR OWNER <i>Dorothy J. Hubbard, Circulating Manager</i>	
15. FOR COMPLETION BY PUBLISHERS MAILING AT THE REGULAR RATE (Section 132.121, Postal Service Manual) 39 U.S.C. 3626 provides in pertinent part: No person who would have been entitled to mail matter under former section 4359 of this title shall mail such matter at the rate provided under this subsection unless he files annually with the Postal Service a written request for permission to mail matter at such rates. In accordance with the provisions of this statute, I hereby request permission to mail the publication named in item 1 at the phased postage rates presently authorized by 39 U.S.C. 3626.			
SIGNATURE AND TITLE OF EDITOR, PUBLISHER, BUSINESS MANAGER, OR OWNER <i>Dorothy J. Hubbard, Circulating Manager</i>			

PS Form 3526 (Page 1)
Aug. 1978

(See instructions on reverse)







59.06

QH301
.A78
*

The ASB

BULLETIN

Volume 27, Number 1

(ISSN 0001-2386)

January 1980



SCIENCE CENTER, UNIVERSITY OF SOUTH FLORIDA

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. Gary E. Dillard, Editor, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, Ms. 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pa. 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

GARY E. DILLARD
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J.C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — James W. Hardin, NC State University, Raleigh, NC 27650

Retiring President — Raymond O. Flagg, Carolina Biological Supply Co., Burlington, NC 27215

President Elect — Franklin F. Flint, Randolph-Macon Woman's College, Lynchburg, VA 24504

Vice-President — Frank McCormick, University of Tennessee, Knoxville, TN 37916

Secretary — Carol C. Baskin, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanc, Emory University, Atlanta, GA 30333

Executive Committee —

Jon R. Fortman (1980), Mississippi University for Women

George M. Simmons, Jr. (1980), VPI & SU

Linda M. Stroud (1981), East Carolina University

James L. Riopel (1981), University of Virginia

Samuel B. Jones, Jr. (1982), University of Georgia

George S. Ramseur (1982), University of the South

AAAS Representative, Section G —

Lafayette Frederick, Howard University

AIBS Representative —

James W. Hardin

CONTENTS

ASSOCIATION AFFAIRS

About the Tampa Meeting 3

Thursday Evening Program for 1980 Meeting 6

ASB Awards: Sponsorship Changes 7

THELMA HOWELL, 1901-1979 7

NEWS OF BIOLOGY IN THE SOUTHEAST 9

MOUNTAIN LAKE COURSES, 1980 13

STREAM ECOLOGY SYMPOSIUM 14

PLANT SYSTEMATIC AND ECOLOGICAL

RESEARCH INDEX 14

TIME AND PLACE OF FUTURE MEETINGS

1980 March 26-29 University of South Florida, Tampa

1981 April 8-10 University of Tennessee, Knoxville

1982 Eastern Kentucky University, Richmond

1983 University of Southwestern Louisiana, Lafayette

PATRONS

Carolina Biological Supply Company; Burlington, NC

Parco Scientific Company; Vienna, OH

Fisher Scientific Company; Chicago, IL

Olinkraft, Incorporated; West Monroe, LA

Beckman Instruments, Incorporated; Norcross, GA

COPY DEADLINES

April Issue: January 1

July Issue: May 15

October Issue: August 15

January Issue: November 15



ABOUT THE TAMPA MEETING

The Association of Southeastern Biologists will hold its 41st Annual Meeting, March 26-29, 1980, at the University of South Florida in Tampa, Florida. Registration, exhibits, Thursday night social hour, the Friday night banquet, and other activities will be held in the University Center.

The University of South Florida extends a cordial welcome to all to attend the meetings and visit the campus and area.

Societies Meeting With ASB

Beta Beta Beta, Southeastern Region
Southeastern Division, American Society of Ichthyologists and Herpetologists
Southeastern Fishes Council
Southeastern Section, Botanical Society of America
Southeastern Chapter, Ecological Society of America
Southeastern Society of Parasitologists
Southern Appalachian Botanical Club

Tampa And The University Of South Florida

Tampa is located midway down the west coast of Florida on one of the finest protected natural harbors in the world. The average minimum and maximum temperatures for March are 56 and 76 degrees Fahrenheit. There are 800+ restaurants, Busch Gardens is within a mile of the University, and Tampa's historic Latin Quarter, Ybor City, is the center of cigar manufacturing in the U.S. Tampa supports two professional sports teams, the Tampa Bay Rowdies Soccer Team and the Tampa Bay Buccaneers Football Team. Horse racing is on at Florida Downs and Turf Club with pari-mutuel wagering in March. Tampa is about 1½ hours drive via Interstate 4 from Disney World. The new Tampa International Airport is considered by many to be the finest in the nation.

Beginning with fewer than 2,000 freshmen when it opened in 1960, the University of South Florida now has over 24,000 students, extensive graduate programs, three regional campuses and a physical plant of 45 fully air-conditioned buildings valued at more than \$150,000,000. USF, one of nine institutions in the State University System of Florida, occupies a 1,695 acre campus in Tampa's northeast outskirts in the heart of a metropolitan area of 1.5 million people.

The Department of Biology is housed in three buildings on the Tampa campus. These facilities are shared by approximately 1,000 undergraduate majors, 100 full time graduate students and 34 full time faculty members. The Department of Biology offers the bachelor of arts in biology, botany, microbiology, and zoology. The graduate program in biology leads to the M.A. degree in botany, microbiology, or zoology and the Ph.D. in biology. Areas of specialization for the doctorate are marine biology, ecology (tropical, population, community, and physiological ecology) physiology (cellular, microbial, neurophysiology), genetics, systematics, and behavior. The department supports a large herbarium, a botanical garden, and an electron microscope facility in addition to a wide variety of research equipment, vehicles and boats.

Travel To USE

AUTOMOBILE: Tampa is primarily served by 2 expressways: I-75 and I-4. USF is located on the northern edge of Tampa, approximately 2½ miles east of I-75. Those driving from the north and west will find I-75 the most convenient. You will enter Tampa from the north and should exit at Fowler Avenue (the 3rd exit). Turn left (east) on Fowler and proceed for 2½ miles. Turn in at the main entrance of the University which will be on your left. Attendants in an information booth located on the main entrance-way will direct you to the University Center.

Members driving down the east coast can reach USF easily via I-95 to I-4 to I-75. You will enter Tampa from the east on I-4 and will turn north onto I-75. Exit at the Fowler Avenue exit, turn right, and proceed 2½ miles east to USF. Information and campus maps can be obtained at a booth on the main entrance-way.

The University has ample parking and parking lots around the University Center have been reserved for you.

AIR SERVICE: Tampa is served by most airlines and has regular flights from all major cities. Travel from the airport to the USF area may be accomplished by car rental or taxi service. There is no commercial limousine service in Tampa. Rental cars may be obtained from several agencies located at or near the airport. Taxis are always available at the airport. USF is approximately 20 miles from the airport, such that the fare for a single person traveling by taxi is about \$12.

RAILWAY PASSENGER SERVICE: Amtrak provides connections between the eastern seaboard and Tampa. The only passenger station is located in downtown Tampa and would require taxi service (ca. 10 miles) to USF.

BUS SERVICE: Both Greyhound and Trailways serve Tampa and have their main terminals in downtown Tampa. Taxi service would be required to reach USF.

N.B. PUBLIC TRANSPORTATION IN TAMPA IS MINIMAL SUCH THAT PRIVATE AUTO OR TAXIS ARE REQUIRED TO REACH ANY DESTINATION!

Dining Facilities

The University Center has a cafeteria and will provide breakfast, lunch, and a limited dinner selection. Surrounding the University are numerous restaurants and most of the motels have restaurant facilities. In the greater Tampa area there are a great many fine restaurants (over 800) including several internationally famous ones. A list of restaurants will be available at registration.

Local Alcohol Mores

Alcoholic beverages are served in most restaurants and lounges until 1-2:00 A.M. There are several watering holes near campus ranging from plain campus beer bars to fancy cocktail lounges. The University Center also serves beer until at least 11:00 P.M. Beer, wine, and mixers are available in grocery stores while other alcoholic beverages may be purchased at privately owned liquor stores in the area.

Accommodations

Please refer to the motel and campground list published in the October Bulletin and make your reservation early.

Registration

Second floor of the University Center, 6-9:00 P.M., Wednesday; 8:00 A.M.-7:00 P.M., Thursday; 8:00 A.M.-11:00 A.M., Friday. Students \$3.00, others \$5.00.

General Schedule

Wednesday: Field Trips to Sarasota or Cockroach Bay.

Thursday: Paper sessions: morning and afternoon.

Business meetings and luncheons (Ecological Society of America, and Southeastern Division of the American Society of Ichthyologists and Herpetologists) (Room TBA).

Exhibits: 8 A.M.-7 P.M., University Center, Room 248.

Placement Service: 8 A.M.-5 P.M., University Center, Room 205.

General Session: 7:30 P.M., New Business Building Auditorium.

Symposia: South Florida Ecosystems.

Social Hour: 9-11 P.M., University Center, Empty Keg.

Friday: Paper sessions: morning and afternoon.

Business meeting and breakfast (Southeastern Section of the Botanical Society of America, and Southern Appalachian Botanical Club): 7 A.M. (Room TBA).

Exhibits: 8-11 A.M., University Center, Room 248.

Placement Services: 8 A.M.-5 P.M., University Center, Room 205.

Symposia: Endangered Species — The Second Step; Teaching Introductory Biology Courses for Majors.

ASB Business Meeting: 11:00 A.M. (Room TBA).

Banquet: 7:00 P.M., University Center, Room 248.

Retiring President's Address: Raymond O. Flagg, Carolina Biological Supply Company.

Saturday: Executive Committee breakfast and meeting: 8:30 A.M. (Room TBA).

Field Trips: Archbold Biological Station and Highlands Hammock State Park or Phosphate Fossil Area near Bartow, Florida.

Local Points Of Interest

A. Campus: USF Botanical Garden, located in the southwestern corner of campus. Open 8:30 A.M.-4:30 P.M., Thursday and Friday.

B. Tampa area:

1. Busch Gardens: The Dark Continent, located at 3000 Busch Boulevard, just south of campus. Largest privately owned wildlife park in America, open air marketplace, restaurants, rides, and shows, 9:30 A.M.-6 P.M.
2. Ybor City and Ybor Square. Picturesque Cuban area with old cigar factory converted into shopping area with specialty shops and restaurant (Rough Riders). 8th Avenue and 13th Street. Take Ybor exit off I-4.
3. University of Tampa and Henry Plant Museum. Private university housed in old hotel on Hillsborough River. Downtown Tampa.

C. St. Petersburg area:

1. Sunken Gardens. 1825 4th Street North. Take I-75 to I-275 in St. Petersburg, then take Sunken Gardens exit at 22nd Avenue North and follow directional signs. Thousands of tropical plants. 9 A.M. till sunset.
2. MGM's Bounty Exhibit, located at 345 2nd Avenue NE. Replica of full-rigged ship made famous by Fletcher Christian's meeting against Captain Bligh. 9 A.M.-10 P.M.
3. Tiki Gardens, located at 196th Avenue and Gulf Boulevard, Indian Shores. Polynesian setting with shops and restaurant (Trader Frank's). 9:30 A.M.-10:30 P.M.
4. Fort Desoto Park. Take I-75 to U.S. 19, south to FLA. 682 (last exit before Sunshine Skyway Bridge), west to FLA 693, south to Park. Old fort, picnic area, and beaches.

D. Orlando area:

1. Walt Disney World, located at Lake Buena Vista, Off I-4, west of Orlando. Magic Kingdom Theme Park with rides, shops, shows, and restaurants. Open 9 A.M. 1½ hours from Tampa.
2. Sea World, located at 7007 Sea World Drive, Orlando, on I-4, take Beeline Expressway (no toll to Sea World). World's largest marine life park featuring Shamu, the killer whale, dolphins, seals, and other shows. Open 9 A.M. 1½ hours from Tampa.
3. Circus World, at I-4 and U.S. 27. Circus theme park with shows, rides, and visitor participation. Open 9 A.M.
4. Star's Hall of Fame, located at I-4 and Highway 528 (Beeline Expressway, no toll) across from Sea World. Wax Museum featuring entertainment stars. Open 10 A.M.-10 P.M.

E. Sarasota area:

1. Sarasota Jungle Gardens, Sarasota, 2 blocks west of U.S. 41, 2 miles north of Bayfront. Bird shows, reptile shows and botanical gardens. 9 A.M.-5 P.M.
2. Ringling Museums, Bayshore Road off U.S. 41, Sarasota. Winter home of John and Mabel Ringling, circus museum, and art museum. Open 9 A.M.-5 P.M.
3. Circus Hall of Fame, U.S. 41 near Bayshore Road, Sarasota. Circus acts, museum, and puppet shows. (Not associated with Ringling Museums.) Open 9 A.M.-5 P.M.
4. Bellum's Cars and Music of Yesterday, located at 550 N. Tamiami Trail (U.S. 41), Sarasota. Over 1200 music machines and 170 antique cars, country store, livery stable, and blacksmith shop. Open 8:30 A.M.-6 P.M.

F. Other areas:

1. Weeki Wachee Springs, 45 miles north of Tampa at U.S. 19 and FLA 50. Bird shows, boat cruise, tropical plantings, and underwater mermaid show. Open 9 A.M.-5 P.M.
2. Tarpon Springs, on Alternate 19 North of Clearwater. Sponge docks, boat trips, and Greek culture.
3. Cypress Gardens, located between Bartow and Winterhaven off U.S. 17. Exotic plants, boat rides, and water ski shows. Open 8:30 A.M.-5 P.M.

Field Trips

Wednesday, March 26

1. Marie Selby Botanical Garden and Allyn Entomological Museum. Both facilities are located in Sarasota which is about 1½ hours drive south of Tampa. Selby Botanical Garden is famous for its collection of epiphytes and the Allyn Museum specializes in Lepidoptera. This is a 3/4-day trip.
2. Cockroach Bay. This bay is about 35 miles south of Tampa bound on the west side of Tampa Bay. It is one of the northern most examples of a mature mangrove swamp and is now a preserve. Raised walkways facilitate viewing the plants and animals characteristic of this tropical tidal marsh. This is a half three-quarters day trip.

Saturday, March 29

1. Archbold Biological Station and Highlands Hammock State Park are interesting features located about 100 miles southeast of Tampa in Highlands County. Highlands Hammock features many virgin stands of live oak-cabbage palm forest with boardwalk to observe the abundant wildlife. Archbold is a research station of

the American Museum of Natural History and features a large area of xerophytic sand pine-scrub with its endemic animals such as scrub jays, Florida mice, and scrub lizards. This is an all-day field trip.

2. The Florida phosphate mines are located in Polk County, approximately 40 miles east of Tampa. These extensive open-pit strip mining operations have exposed very rich vertebrate and invertebrate fossil fauna which are Pliocene and Pleistocene in age. Collectors can easily find sharks teeth, mammal bones, turtle fragments, crocodilian teeth, etc. while walking the spoil banks. This is a half-day field trip.

The directors and curators of the various field stations, museums and gardens have graciously offered their time and facilities for these field trips. We feel that it is only reasonable to inform them as to the number of scientists they can expect to tour their facilities at least three weeks prior to the trip. This would give them time to make any necessary logistical arrangements. Therefore we are requesting that you indicate your interest(s) in these field trips by simply recording them on a postcard, and sending it to Dr. Larry Brown, Department of Biology, Tampa, FL 33620 by February 29, 1980. The card need not contain any other information. If we do not receive any indication of interest in a particular trip by February 29, that trip will be cancelled. Please take the time to inform us of your plans.

Local Arrangements Committee

Chairperson:	Frederick Eilers
Assistant Chairpersons:	Diane Merner, Clinton Dawes
Registration:	Earl McCoy
Program/meeting Rooms:	Richard Wunderlin
Exhibits and Publicity:	Daniel Lim
Field Trips:	Larry Brown
Projection Equipment:	Albert Latina
Transportation and Parking:	Bruce Cowell
Housing:	John Romeo
Placement Bureau:	Lee Weber
Social Arrangements:	Allan Michaels

FORTY-FIRST ANNUAL MEETING PROGRAM FOR THURSDAY EVENING DR. RONALD SCOGIN

LIVING FOSSILS AND MOLECULAR CLOCKS: THE PHYLOGENETIC INFORMATION IN AMINO ACID SEQUENCES

ABSTRACT

Recent fundamental discoveries in molecular biology have shown that the historical information present in biological genomes can be deciphered and used to construct systematic genealogies. The results to date using amino acid sequences in plant and animal systems will be considered. The advantages (and disadvantages) of molecular data over morphological data are several. These, along with recently arisen problems of interpretation of molecular data, will be discussed. The accuracy of molecular phylogenies at our present level of understanding will be considered.

BIOGRAPHICAL SKETCH

Dr. Ronald Scogin received his undergraduate and graduate degrees at the University of Texas at Austin in zoology and botany, respectively. He is currently experimental taxonomist at the Rancho Santa Ana Botanic Garden and associate professor of botany at the Claremont Graduate School. Dr. Scogin's research interests include the use of comparative plant biochemistry and amino acid sequences in systematic studies. He is currently investigating biochemical adaptations in plants to pollination by bats.

SPONSORSHIP CHANGES

Beginning with our Forty-first Annual Meeting in 1980, sponsors for ASB Awards will be as follow. Please refer to the October Issue of the *Bulletin* for application instructions.

The Meritorious Teaching Award, consisting of a medallion and a \$1,000 cash award, will be sponsored by the **Carolina Biological Supply Company** of Burlington, North Carolina.

The Association Research Prize, consisting of a \$500 cash award, will be sponsored by **Beckman Instruments, Incorporated** of Norcross, Georgia.

THELMA HOWELL

1901 - 1979



Thelma Howell, Director of the Highlands Biological Station from 1946 to 1972, died in Highlands 23 September 1979. "Doc" Howell in all her outspoken, down-to-earth fullness was perhaps better known to Southeastern biologists than any other single member; she certainly gave practical, professional aid to more field biologists for pre-doctoral or post-doctoral research than most teachers of the region.

The citation for her Honorary Degree of Doctor of Science bestowed by North Carolina State College on 27 May 1961 reads as follows: "As an avid wielder of the fly-rod in the cool trout streams of our highlands, as an important laboratory scientist for whom another species of fly has had the honor to be named, as an inspiring teacher, and as an efficient administrator. THELMA HOWELL has earned the admiration not

only of the native folk of the Southern Appalachians but also of scientists, business men, and educators everywhere. She was early nicknamed 'Doc' Howell by her family, her friends, and her students. North Carolina State College is now pleased to give official confirmation to the title by awarding her the degree of Doctor of Science."

Rather than carrying on extensive research herself, she used her immense energies to provide the proper facilities for all those who came to Highlands to engage in any of the many fields of biology. That whole steady stream of biological discovery which flowed from the station is the true measure of her life achievement.

Born in New Bern, N.C., 6 March 1901, Thelma Howell, daughter of John Hamilton and Mary Smith Howell, was a post-humous child. She became the last survivor of her immediate family, but she remained a member of a well-ramified eastern Carolina clan of the Howells and Styrons of whom she was justifiably proud. She took her B.A. at Trinity College in 1922; after teaching high school in western Carolina for a few years, she became a graduate student at Duke University, where she received an M.A. in Zoology in 1931. For 3 years she taught at Western Carolina Teachers College (now W.C.U.); then in 1934 she went to Wesleyan College, Mason, Georgia, where she remained a member of the Biology Department for 25 years, becoming Chairman of the Department and finally Chairman of the Division of Natural Science and Mathematics. As an indication of her popularity as a teacher, the student's dedicated the year-book to her.

At Duke she had begun her research on amphibians — speciation of salamanders and the blood of frogs. In the summer of 1938, she undertook work on amphibian blood at the Highlands Biological Station. By 1944, in the enforced absence of Dr. W. C. Coker, she was named Acting Director of the station. In 1946 she became Executive Director. While she continued to do research, particularly on salamanders, and published her results in the journals through the 1940's, gradually she turned her attention more and more to the needs of the other workers at the station. In her early years as Director at Highlands she spent only her summers there; but in 1959, upon completing 25 years at Wesleyan, she resigned her position there to become Director in Residence at Highlands, taking up permanent residence in the town. So closely did she become identified with the station that the period of her Directorship, 1946 to 1972, is now known as the Era of Doc Howell. During that time, her major efforts were directed toward supplying the optimum conditions for the maximum amount of field work in the southern Blue Ridge.

Upon assuming the directorship, her first and continuing concern was to enlist the cooperation of the Biology departments of southeastern universities and colleges in the work at Highlands. When she first took over in 1944, four institutions were cooperating; by the time of her retirement there were 13. From the start she car-

ried the main responsibility for financing the work of the station, year by year. But she was not satisfied just to maintain the status quo. She had plans that required raising even more funds. Early in her office, she turned her attention to getting money to be used for scholarships for research workers at the station. With the aid of members of her Board, she received the first NSF grant to be used for scholarships in 1956. Ever since then the station has been able to award a substantial number of grants-in-aid to research workers. Under her directorship the station received gifts and funds (chiefly from NSF) for modern laboratories, dormitories, and an administration building; in fact, most of the present physical plant forms part of her legacy. Although most of the research was individually oriented, under Doc's leadership the station undertook a coordinated, long-range ecological study, financed by a succession of NSF grants, of the Blue Ridge escarpment, along the N.C.-S.C.-Ga. state lines, just before most of the major gorges were to be flooded by water for the Duke nuclear power plant. Many of the results of this remarkable 8-year study are now in print; they have yet to be fully evaluated or exploited. Also, Dr. Howell inaugurated the Reinke Scientific Library at the station, and gave strong support to the development of the Botanical Garden. After taking up residence in Highlands, she found herself host and guide to countless visitors and traveling investigators at the station every month of the year. No biologist who visited the southern Blue Ridge could be unacquainted with her hospitality in terms of time and information.

In the long run, her efforts were directed toward the achievement of scientific results by all the workers she aided through the station. It is estimated that some 400 individual projects were carried on at the station under her administration, and that at least 300 scientific publications resulted from this work, covering a spectrum from Palynology to Ephemeroptera. Her achievement was to prove the productivity of biological field work in the southern highlands.

And all those visitors to Highlands? In any book which touches on some aspect of the biology of the Southeast, one is likely to find a handsome acknowledgment to Doc Howell for help. Readers of this Bulletin will find some such book, or books, on their own shelves with this pleasant reminder of her full role in disseminating scientific knowledge.

But the reader will scarcely need this reminder to bring to mind the vital personality of Doc Howell. Of fabulous energy and memory, with long vision and always well-prepared for any critical encounter, she took a down-to-earth, no nonsense approach to all professional contacts and problems. She had opinions on every subject and freely voiced them. She became a ring-leader in small groups meeting off hours, where her talents for salty narrative and wicked mimicry were well known and prized.

She had three interests beyond science and her scien-

tific colleagues: fishing (see citation above); mineral collecting; politics and public service. For many years she served on the local Hospital Board; for 14 years she was a member of the Highlands Town Council where her vigor and knowledge aroused the whole populace as no other council member has ever done. She became Chairman of the Democratic Party of Macon County. On 17 October 1979, Lamar Gudger, U.S. Representative of the 11th Congressional District of North Carolina

eulogized her for the *Congressional Record*, barely mentioning the Biological Station in passing. Doc would have been flattered by the Congressional notice. But when Representative Gudger called her "a frontier woman," and announced that she typified "the Appalachian woman," Doc's response would easily have been a snide, "Pooh."

Ralph M. Sargent
Past President, Highlands Biological Station

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — James Wilkes, Troy State University

Florida — Vacant

Georgia — Fred K. Parrish, Georgia State University

Illinois — George T. Weaver, Southern Illinois University

Kentucky — Joe E. Winstead, Western Kentucky University

Louisiana — Harry J. Bennett, Louisiana State University

Maryland — Don Windler, Towson State University

Mississippi — Bruce Lacey, Mississippi University for Women

North Carolina — Vacant

South Carolina — G. Thomas Riggan, Jr., Newberry College

Tennessee — John R. Freeman, University of Tennessee at Chattanooga

Virginia — Jean Pugh, Christopher Newport College

West Virginia — Roy B. Clarkson, West Virginia University

JON R. FORTMAN — *News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

About People

Auburn University. Drs. Tom J. Timmons and Terry King have received a grant from the Army Corps of Engineers for a three year study of fish shelters and population dynamics in the Tombigbee River.

Troy State University, Department of Biological Sciences. Ms. M. Brouder has been selected to attend the NSF short course entitled, "Frontiers of Neurosciences," to be held at the University of Georgia in October and March, 1979.

University of North Alabama, Department of Biology. Dr. Paul Yokley, Jr. has been elected Vice President for the Southeastern Region of Beta Beta Beta Biological Society. Dr. Yokley is also the recipient of a grant from the Soil Conservation Service for a study of two rare mussel species in the Spring Creek Watershed in Franklin and Colbert Counties, Alabama. Dr. Jack H. Moore is serving as President of the Alabama Academy of Science for 1979. Dr. Charles Keys is serving as the Chief Health Professions Advisor for the University. John W. Holland, Jr. has been promoted to Associate Professor.

Auburn University, Department of Botany, Plant Pathology, and Microbiology. Professor James A. Lyle retired recently from the University. The department has a new name: Department of Botany, Plant Pathology and Microbiology, and a new Head, Dr. Paul A. Lemke. Dr. Lemke was formerly on the faculty of Carnegie-Mellon University in Pittsburgh, Pennsylvania.

Eckerd College, Division of Natural Sciences. Sheila D. Brack-Hanes, Assistant Professor of Biology, has received an NSF Grant for fossil lycopod studies.

Florida State University, Department of Biological Sciences. Dr. Robert Hunter Reeves (Ph.D., New York University — Biochemistry) assumed the position of Associate Professor of Biological Science and Director of the Program in Medical Sciences. He was with the Department of Microbiology at the University of Ten-

nessee Center for the Health Sciences. Dr. Dietmar Rabussay joined the Department in September. He received the degree of "Doctor rerum naturalium" (Ph.D.) at the University of Munchen, W. Germany, and was visiting scientist, Max-Planck-Institute for Biochemistry, Munchen, before coming to F.S.U.

University of Florida, Department of Botany. Professor Indra K. Vasil was appointed Graduate Research Professor. Professor James W. Kimbrough was elected President of the Mycological Society of America. Professor William Louis Stern, formerly of the University of Maryland, became Chairman of the Department in September. Professor Daniel B. Ward has just completed and published the plant volume of Rare and Endangered Biota of Florida.

Jacksonville University, Department of Biology. Dr. A. Quinton White, Assistant Professor, was named editor for the Estuarine Research Federation Newsletter. Dr. John E. Trainer, Associate Professor, was promoted to the post of Assistant Dean of Faculties. Dr. Ted T. Allen, Professor, participated in Arizona wildlife surveys for the Bureau of Land Management for 10 weeks this summer. Mr. Terence O. Weitzel, Assistant Professor, was a reader for the Advanced Placement Program at Ryder College. Dr. Kenneth Relyea, Associate Professor, was appointed to the Florida Committee on Rare and Endangered Biota. Dr. Jesse S. Robertson was promoted to Professor.

Florida State Museum, Department of Natural Sciences. The Museum has a new director, Wayne King, who comes from the New York Zoological Society. He replaces J. C. Dickinson, who still maintains an office in the Museum. The new chairman of Natural Sciences is Charles Woods, from the University of Vermont. Carter Gilbert has received support from NSF to put a compactor system in place in ichthyology. Bruce MacFadden received a grant to set up a paleomagnetic center to do field work in Bolivia. Walter Auffenberg has

recently received NSF funding to search for fossil tortoises in Tanzania, and his assistant, **Peter Meylan**, is now in Laetolil and will be in Olduvai. **Liz Wing** has just returned from Peru where she spent over 6 weeks working with the Peruvian government on a dig. **Fred Thompson** and **Dick Franz** were in Haiti during the spring on a National Geographic grant. **Charles Woods** and **Margaret Langworthy** were also in Haiti supported by NSF studying the evolution of Capromyid rodents. **Ms. Langworthy** joined the staff as a Research Associate.

Georgia State University, Department of Biology. **Dr. D. G. Ahearn** and **R. A. Schlitzer** have received an industrial grant from Burrows Welcome Co. for examination of bacteria associated with eye infections. On September 1, the Dean of Arts and Sciences announced the formation of an interdisciplinary research program to be staffed by members of the Chemistry and Biology faculties. Members include: **Ahmed T. Abdelal**, **Donald G. Ahearn**, **Alfons L. Baumstark**, **David W. Boykin**, **Robert Cherniak**, **Warren L. Cook**, **Sidney A. Crow**, **Peter E. Gaffney**, **Harry P. Hopkins, Jr.**, **Adly N. Ibrahim**, **Ronald G. Jones**, **Sally A. Meyer**, **William G. Nolan**, **Frank L. O'Brien**, **Donald J. Reinhardt**, **Jerry C. Smith**, **Eleanor B. Smithwick**, **Leland P. Vickers**, **W. David Wilson**, and **Kristina Wright**. The Laboratory is envisioned as the cornerstone of an interdisciplinary doctoral program in microbial and biochemical sciences. **Sally A. Meyer** presented a series of invited lectures on yeast systematics and yeasts as indicators of pollution at the Instituto de Microbiologia, Universidad Federal, Rio De Janeiro, Brazil. **Dr. Blanche Malecka-Griggs** attended the 11th International Congress of Chemotherapy and the 19th Interscience Conference on Antimicrobial Agents and Chemotherapy in Boston. The following faculty presented papers this fall: **Dr. Blanche Malecka-Griggs**, 10th International Conference on Health Education in London, "An Educational Audio-Visual Study Module: Protection, Care and Maintenance of Healthy Eyes for Users of Contact Lenses and Periocular Cosmetics"; **Dr. Sidney Crow**, 3rd International Marine Mycological Symposium, Morehead City, North Carolina. "The Uptake of Aromatic and Branched Chain Hydrocarbons by Yeast" (coauthors: **S. L. Bell** and **D. G. Ahearn**); **Dr. Sidney Crow**, 3rd International Symposium on Aquatic Pollutants, Jekyll Island, Georgia, "Uptake of Aromatic Hydrocarbons by Yeast"; **Dr. D. G. Ahearn** was chairman of the Petroleum Microbiology Division of the 3rd International Marine Mycology Symposium held at Morehead City, North Carolina. He presented a paper entitled "Hydrocarbonoclastic Fungi and Bacteria from the Oil Spill Site at Brest, France".

West Georgia College, Biology Department. **Dr. Robert McClam Welch** retired July 1, 1979. **Dr. Welch** had been associated with the Biology Department for twelve years prior to his retirement.

Wesleyan College, Department of Science and Mathematics. **Dr. Bruce R. Bartless** (Ph.D., Oregon State University — Zoology) has been appointed Assistant Professor of Biology. He recently completed a post-doctoral fellowship with the Fort Pierce Bureau of the Smithsonian Institution. **Dr. Anne Cornish Frazer** (Ph.D., Tulane University — Microbiology) joined the faculty for the fall term.

University of Georgia, Botany Department. **Dr. Gayther L. Plummer**, Professor, has transferred from the Botany Department to the Institute of Natural Resources. New faculty in botany include: **Dr. Lee H. Pratt**, Professor, from Vanderbilt University, plant physiology and photobiology; **Dr. Gregory W. Schmidt**, Assistant Professor, from Rockefeller University, chloroplast and photosynthetic membrane biogenesis; and **Dr. Robert Wyatt**, Assistant Professor, from Texas A & M

University, population ecology and plant variation and evolution.

Murray State University, Department of Biological Sciences. **Charles E. Kupchella**, formerly Associate Professor of Oncology and Associate Director of the University of Louisville Cancer Center, was appointed Professor and Chairman of the Department of Biological Sciences.

Louisiana State University, Department of Botany. **Dr. Shirley C. Tucker** completed a sabbatical leave at Victoria University, Wellington, New Zealand. She collaborated with **Dr. Bruce Sampson** on research supported in part by an NSF grant to **Dr. Tucker**. LSU and the Department of Botany have received a grant from the USDA Animal and Plant Health Inspection Service for a survey of noxious weeds in Louisiana. **Dr. Russell L. Chapman** has been appointed an Associate Dean of the College of Arts and Sciences. He retains a part-time appointment in the Department of Botany wherein he will continue his research program assisted by **Mrs. Margaret C. Henk** who has joined the staff as a Research Associate. **Michael T. Postek**, Research Associate and doctoral candidate, was recently re-elected Secretary of the Louisiana Society for Electron Microscopy, Inc. and began his second term in office. Other members of the LSEM Executive Council include **Russell L. Chapman**, Past-President, and **Karen Howard** (Department of Microbiology, LSU), President-Elect. **Dr. Lowell E. Urbatsch** has received funding from NSF for a research project entitled, "Systematics of the Genus *Calea*." The project will provide a taxonomic treatment for the genus based on morphological, anatomical, chemical and cytogenetic data.

University of Southwestern Louisiana, Department of Biology. **Dr. Hinton D. Hoese** has been selected to serve as the interim director of the Louisiana Universities Marine Consortium. **Dr. Hoese** will be responsible for the administration and development of the Consortium until a permanent director is hired. A coastal laboratory facility will be constructed south of Houma at Cocodrie, Louisiana. Several grants were recently received by members of the Department: **Drs. W. Ross Ellington** and **Sydney Craig** received an NSF grant to purchase scientific equipment for physiology and cell biology. **Drs. Betty Lemmon** and **Roy Brown** received a travel grant from the Southern Regional Education Board to use the EM laboratory at LSU-Baton Rouge. **Dr. Brown** also was awarded a grant from the American Philosophical Society to study spore wall development in mosses.

Mississippi State University, Department of Biological Sciences. **Dr. Lewis R. Brown** has received a research contract from the Department of Wildlife Conservation, Bureau of Marine Resources, for a project entitled "Biologically-treated Shrimp Waste as a Seed Treatment to Control Pathogenic Fungi." **Dr. Brown** was one of ten invited participants in a Department of Energy workshop held in San Diego, California, on August 29-31, 1979. The purpose was to formulate a research program to study microbial processes useful in enhanced oil recovery. He was also invited to participate in the NOAA Gulf of Mexico Planning Workshop held in Miami. The purpose was to formulate a research plan to acquire the information necessary to manage the Gulf of Mexico wisely.

Belhaven College, Biology Department. **Dr. Donn D. Martin** has been named Chairman of the Department replacing **Dr. Wayne Walley** who now chairs the Department of Biology at Delta State University.

Jackson State University, Department of Biology. **Sylvanus Weathersby**, a student at Jackson State, is participating in the Environmental Sciences Cooperative

Curriculum at the Oak Ridge National Laboratory. She is assigned in the Environmental Sciences Division under the direction of **R. B. McLean** and **Marshall Adams**, who are doing research on predatory fish and the utilization of a variety of prey.

Alcorn State University, Department of Biological Science. **Dr. Willie D. Humphrey**, a graduate of Mississippi State University, has been appointed Chairperson to the Department. **Dr. Humphrey** is in the process of establishing a program of study in aquatic and marine biology. **Dr. Alice M. Russell** has been appointed Director of Biomedical Research at Alcorn State. **Dr. Russell** is a graduate of Marquette University with special research emphasis in immunogenicity of human serum albumin. **Dr. Henry L. Parker** retired at the end of the 1979 summer session. **Dr. Parker** has served as Chairman of the Department and Director of Biomedical Research.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. The GCRL has begun a cooperative agreement contract with the EPA Environmental Research Laboratory at Gulf Breeze, Florida, to develop and evaluate fate/toxicity screening tests for organic materials that may be hazardous to the environment. **Dr. William W. Walker** is the principal investigator along with co-investigators, **Drs. Al Bourquin** and **Hap Pritchard**. A grant-in-aid award from the National Marine Fisheries Service has been received to provide biological data and other information needed for management of Mississippi's fishery resources. **J. Y. Christmas** is the principal investigator; **Harriet M. Perry** and **John Ogle** are project leaders, and they will be assisted by five technicians. **Drs. William W. Walker** and **Edwin W. Cake, Jr.** are involved in a project entitled, "Bioconcentration Test: Inter-Laboratory Comparison Using the Eastern Oyster." The GCRL has received a three-year contract for the continuation of an anadromous fish project, "The Restoration of Striped Bass in Mississippi." **Dr. Thomas McIlwain** is principal investigator for the project. **Dr. Sally Leonard Richardson** has been notified of her selection as an Outstanding Young Woman of America for 1979. She received her Ph.D. in marine science from the Virginia Institute of Marine Science, College of William and Mary. Her primary research interests are the systematics of larval marine and estuarine fishes. A contract has been awarded to the Laboratory to develop guidelines for oyster relaying on the Gulf Coast. Principal investigators for the Food and Drug Administration project are **Drs. David W. Cook** and **Edwin W. Cake, Jr.** **Dr. R. D. Ellender**, Associate Professor of Microbiology at the University of Southern Mississippi, will also serve as a co-investigator. A year of histopathological studies on Gulf Coast oysters to determine the presence of intracellular parasites and observable tissue changes related to the growing environment of the oysters has begun with a grant provided by the Mississippi-Alabama Sea Grant program. **Dr. William E. Hawkins** is the principal investigator.

National Marine Fisheries Service, Beaufort, North Carolina Laboratory. **Dr. Gordon W. Thayer** recently was selected to serve a three year term as an associate editor of *Estuaries*. The Beaufort Laboratory of NMFS recently awarded two contracts to assist in the study of food webs and pollutant transfer to larval fishes in the Gulf of Mexico. **Gordon Thayer** and **William Sunda** of the Beaufort Laboratory are project managers for these contracts.

North Carolina State University, Department of Zoology. New appointments are **Dr. Robert M. Grossfeld**, Assistant Professor; **Dr. Betty L. Black**, Assistant Professor; **Dr. Roger A. Powell**, Assistant Professor; **Dr. Marianne Feaver**, Assistant Professor; **Ms. E. Dale**

Kennedy, Visiting Instructor; **Mr. S. Douglas Miller**, Visiting Instructor; and **Dr. Joseph R. Lombardi**, Visiting Assistant Professor. **Dr. Frederick S. Barkalow, Jr.**, Professor of Zoology, has retired from the Department. **Dr. Jay D. Hair**, Associate Professor of Zoology and Forestry, has been selected by the U.S. Department of the Interior to coordinate the development of a National Fish and Wildlife Policy. As a part of this activity he delivered the keynote address at the Annual Conference of the Western Association of Fish and Wildlife Agencies, Anchorage, Alaska, July 22-26, 1979. **Dr. Frederick S. Barkalow**, Professor Emeritus of Zoology and Forestry, received the Department of the Interior Public Service Award for his outstanding work in conservation and wildlife management.

Wake Forest University, Department of Biology. **Dr. Ramunas Bigelis** joined the Department in the fall of 1979. A biochemist, he received the Ph.D. at Purdue and spent three years as a postdoctoral fellow at Cold Spring Harbor Laboratory and another year at Cornell University. **Dr. Raymond Kuhn** received an NIH grant to study immunosuppression in Chagas' disease. The Department of Energy has awarded a contract to **Dr. Gerald Esch** for continued study of red-sore disease in the southeastern U.S. Much of this work is being conducted at the Savannah River Plant with the cooperation of the Savannah River Ecology Laboratory.

University of South Carolina, Department of Biology. The following faculty have been awarded research grants: **Dr. Anthony H. C. Huang**, USDA, "Peroxisomal Metabolism in Relation to Photorespiration"; **Dr. Edwin H. Liu**, NOAA, Sea Grant Program, "Biologically Important Carbohydrate Binding Lectins"; **Dr. Nawin C. Mishra**, DOE, "Genetics and Biochemistry of DNA Repair in *Neurospora crassa*"; **Dr. L. Harold Stevenson**, NOAA, "Material Fluxes — Transport of Fungi"; and **Dr. Mary F. Finlay**, MARC Faculty Fellowship from NIH to conduct research in the laboratory of **Dr. E. Aubrey Thompson**.

East Tennessee State University, Department of Biology. The Third International Symposium on the Tardigrada will be held August 3-6, 1980, at East Tennessee State University, Johnson City, Tennessee. Topics include the history and future of tardigrade research, ultrastructure of tardigrades, population dynamics and ecology, cytology, species diversity, and the application of electron microscopy and other contemporary techniques to tardigrade systematics. Invited papers, workshops, discussions and field trips are scheduled. For further information, contact **Dr. Diane R. Nelson**, Department of Biological Sciences, ETSU, Johnson City, Tennessee 37601 (P.O. Box 23590A). **Dr. Robert Samuels**, ETSU, as Chairman of the Society of Protozoologists Hutner Prize Committee, presented the award to **Dr. George C. Hill** of Colorado State University. **Dan M. Johnson** (ETSU) and **Philip H. Crowley** (University of Kentucky) are collaborating on a research project sponsored by NSF entitled, "Collaborative Research on the Coexistence of Littoral Odonata."

Austin Peay State University, Department of Biology. **Dr. Gary Vidrine** has been appointed Assistant Professor. **Dr. Vidrine** will teach classes in virology and tissue culture and assist in the development of a new program in clinical microbiology. The Department has affiliated with the Department of Radiology, Vanderbilt University Medical Center, for clinical training of nuclear medicine technologists. The first class began Fall, 1979, with seven students.

Memphis State University, Department of Biology. The Charter Meeting of the Mid-South Biology Teachers Association (MSBTA) convened September 27, 1979, on the Memphis State University campus. Nineteen biology

teachers from the Memphis area were in attendance and **Glen E. Peterson**, Professor of Biology at Memphis State, presided. For further information about this new organization, write or call: **Glen E. Peterson**, Department of Biology, MSU, Memphis, Tennessee 38152, (901) 454-2262.

University of Tennessee, Knoxville, Botany Department. **Brian Boom**, a graduate student, was awarded a travel grant by the Smithsonian Institution to work on *Isoetes* at the National Herbarium. **Dr. H. R. DeSelm** is Project Director on a new contract with the National Park Service to conduct a survey of the plant communities and endangered and threatened species of the proposed Obed Wild and Scenic River. **Mr. Paul Schmalzer** is employed as Research Assistant on the project.

University of Richmond, Department of Biology. **Dr. John C. Strickland** retired from active teaching at the end of the 1978-79 school year. Joining the staff for the 1979-80 year are **Dr. Kathryn J. Schneider** (Ph.D., Princeton University) and **Mrs. Kristen P. Giebel**, who is working on research for the Ph.D. from the University of North Carolina. Employed for one semester is **Mr. Joseph C. Mitchell**, Ph.D. candidate at the University of Tennessee, while **Dr. William S. Woolcott** is on sabbatical leave.

University of Virginia, Charlottesville, Department of Biology. **Dr. Maureen Hanson** joined the faculty on September 1, 1979. The Departments of Biology, Anatomy and Obstetrics and Gynecology have received a grant from the National Institute of Child Health and Human Development for Pre- and Postdoctoral Training in Early Development. The Program Director is **Dr. Charles P. Emerson, Jr.**, and information on the program may be obtained by writing to him c/o Department of Biology, Gilmer Hall, University of Virginia, Charlottesville, Virginia 22901. **Dr. Oscar L. Miller, Jr.** has retired from his position as Chairman. He is succeeded by **Dr. Robert H. Kretsinger**. **Dr. Miller** will remain active in the teaching and research activities of the Department.

Virginia Commonwealth University, Department of Biology. New faculty are: **C. Jo Farnham** (Ph.D., University of Florida) from the University of Washington; **Michael Fine** (Ph.D., Rhode Island University) from Cornell; **Jimmy Lee** from SUNY-Stony Brook; **Leonard Smock** (Ph.D., North Carolina) from North Carolina; **Michael Weinstein** (Ph.D., Florida State) from industry and **Catherine Corson** from Virginia Commonwealth University. **Walter L. Richards** has retired from the Biology faculty as of this year.

Western Kentucky University, Department of Biology. **Dr. Rudolph Prins** was elected President of the Kentucky Academy of Sciences at a recent meeting held at Northern Kentucky University. **Dr. Larry P. Elliott** has received a grant from the Council of Higher Education of the Commonwealth of Kentucky for the fourth consecutive year. The grant will provide clinical experience in medical techniques.

George Washington University, Department of Biological Sciences. **Drs. John R. Burns** and **Elizabeth Fortson Wells** have joined the Department as Assistant Professors.

About Institutions

University of Virginia, Charlottesville, Department of Biology. The Department is constructing a P-3 facility for recombinant DNA research. The construction of the facility is partially funded by a grant from the National Institute of Allergies and Infectious Diseases. The facility will be operational by November 1, 1979.

Jacksonville University. A NSF grant was received for a Marine Science Teachers' Workshop. It was held on July 16 through August 10, 1979.

West Georgia College, Biology Department. A Bachelor of Science Degree with a Major in Biology has been instituted beginning with the Fall Quarter of 1979.

Murray State University, Department of Biological Sciences. Hancock Biological Station on Kentucky Lake has recently added an 8 slip covered dock with livebox moorage in addition to permanent housing for two 28 foot pontoon boats and smaller workboats. The Station also has added aquarium space, a serial dilution system, holding pens for birds and mammals and seven 1500 gallon tanks. Personnel at the Station are currently involved in a number of aquatic studies. Grants have recently been awarded for the commercial fisheries/*Corbicula* to **J. B. Sickel** and **D. W. Johnson** and fish attractor (OWRT to **D. W. Johnson**) studies. The Director of the Station, **D. W. Johnson**, will spend January doing fish physiology research at the University of Tel-Aviv as part of an Israel-U.S. Binational Science Foundation collaboration.

Belhaven College, Biology Department. Under the sponsorship of the Department of Biology, a new science organization has been formed at Belhaven. The Belhaven Science Organization (BSO) seeks to include all Belhaven students interested in any area of science in a common partnership of participation in various social, civic and science based programs. Canoe trips, backpacking excursions, helping with various handicapped groups of people, community blood pressure monitoring, and C.P.R. training classes are being planned for this year.

North Carolina State University, Department of Zoology. A new \$2.6 million addition was completed in August, 1979, for the academic program in biological sciences.

Virginia Commonwealth University, Department of Biology. The first phase of a three phase remodeling project for the Life Science Building is underway and includes the construction of new laboratory animal facilities.

Mountain Lake Biological Station announces postdoctoral research funds available for summer field work at the Station. Funds total \$1700 for the 10 week session. Proposals for studies on a wide variety of terrestrial and fresh water environments will be considered. Deadline: April 1, 1980. Write to: **James L. Riopel**, Director, Mountain Lake Biological Station, Gilmer Hall, University of Virginia, Charlottesville, VA 22901. Equal Opportunity/Affirmative Action Employer.



**ANNOUNCING
MOUNTAIN LAKE BIOLOGICAL STATION
SUMMER COURSES 1980**

First Term (June 11-July 15)

4 semester credits

AQUATIC ECOLOGY

D. G. Meyers, Philadelphia Academy of
Natural Sciences

HERPETOLOGY

D. A. Merkle, Longwood College

PLANT TAXONOMY

R. E. Wyatt, University of Georgia

PTERIDOLOGY

A. M. Evans, University of Tennessee

WILDLIFE ECOLOGY

J. O. Wolff, University of Virginia

STATISTICS & COMPUTER METHODS FOR

FIELD BIOLOGY (offered both terms)

D. D. Lieberman, University of Virginia

Second Term (July 17-August 20)

4 semester credits

ENTOMOLOGY

G. W. Byers, University of Kansas

EVOLUTIONARY ECOLOGY

M. E. Lieberman, University of Virginia

**FIELD BIOLOGY OF APPALACHIAN
PLANTS**

A. J. Sharp, University of Tennessee

MAMMALOGY

R. E. Barry, West Virginia University

PHYCOLOGY

D. F. Chappell, Wheaton College

PLANT ECOLOGY

I. A. Ungar, Ohio University

Graduate and Undergraduate Credit — 2 hour research courses in all teaching areas.

Maximum course load each term is 6 semester credits.

Scholarships: Numerous Service Awards available for students, covers all room and board costs.
Post-doctoral Research Awards (\$1700) available for 1980.

For further information and application write:

JAMES L. RIOPEL, Director
Mountain Lake Biological Station
Gilmer Hall
University of Virginia
Charlottesville, VA 22901

STREAM ECOLOGY SYMPOSIUM

October 19-22, 1980 — Augusta, Georgia USA

The Savannah River Ecology Laboratory, in cooperation with the University of Georgia's Institute of Ecology, the U.S. Department of Energy, and the National Environmental Research Park program, will host a symposium on the ecology of lotic ecosystems. The symposium format will include presentations by invited speakers, panel discussions, and contributed papers.

A major theme of the symposium is the identification of fundamental principles that determine structure and function of flowing water systems. We strongly encourage participants to make generalizations based upon research experience, including theoretical work, models of all imaginable sorts, experiments, and data collected in monitoring programs. Presentations on lotic energy flow, nutrient cycling dynamics, particle processing, responses to perturbation, man-stream interactions, stream models, and watershed studies are encouraged.

Papers for oral presentation and publication in symposium proceedings will be selected on the basis of quality, originality of research, and relevance to contemporary stream research. Abstracts (200 words or less, typed double-spaced) for oral presentation are due June 1, 1980. Speakers will be notified of acceptance by July 1, 1980. Authors who submit manuscripts for publication must do so by August 1, 1980. Manuscripts should be concise and conform to the standards of the CBE Style Manual.

For additional information contact: Thomas D. Fontaine, III or Steven M. Bartell, Co-chairpersons, Savannah River Ecology Laboratory, P.O. Drawer E, Aiken, South Carolina 29801 USA. Phone: (803) 725-2472.

INDEX OF CURRENT PLANT SYSTEMATIC AND ECOLOGICAL RESEARCH IN THE SOUTHEASTERN UNITED STATES

Update

This Fall registry cards for the Southeastern Index were mailed to 88 institutions in 16 states. So far 25 institutions from 13 states have returned over 100 cards. For any who have not responded as yet we ask that you please take the time to respond. If your institution or you do not have cards, please contact us. James F. Matthews, Department of Biology, UNC/Charlotte; Charlotte, N.C. 28223.



301. A78
57.06

The ASB

BULLETIN

Volume 27, Number 2

(ISSN 0001-2386)

April 1980



A. M. N. Fl.

Agalinis purpurea

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. Gary E. Dillard, Editor, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, Ms. 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pa. 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, Al. 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

GARY E. DILLARD
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J.C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — James W. Hardin, NC State University, Raleigh, NC 27650

Retiring President — Raymond O. Flagg, Carolina Biological Supply Co., Burlington, NC 27215

President Elect — Franklin F. Flint, Randolph-Macon Woman's College, Lynchburg, VA 24504

Vice-President — Frank McCormick, University of Tennessee, Knoxville, TN 37916

Secretary — Carol C. Baskin, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbank, Emory University, Atlanta, GA 30333

Executive Committee —

Jon R. Fortman (1980), Mississippi University for Women

George M. Simmons, Jr. (1980), VPI & SU

Linda M. Stroud (1981), East Carolina University

James L. Riopel (1981), University of Virginia

Samuel B. Jones, Jr. (1982), University of Georgia

George S. Ramseur (1982), University of the South

AAAS Representative, Section G —

Lafayette Frederick, Howard University

AIBS Representative —

James W. Hardin



CONTENTS

Abstracts, 41st Annual Meeting, 1980	19
Symposia, 41st Annual Meeting, 1980	74
News of Biology in the Southeast	75

COVER

Scanning electron micrograph of self-attachment of the root parasite *Agalinis purpurea*. Haustoria were chemically induced and the specimen fixed after 36 hrs. The specimen was examined at an angle of 45° on an E.T.E.C. Autoscan at 20kV accelerating voltage. Courtesy of Vance Baird, University of Virginia.

TIME AND PLACE OF FUTURE MEETINGS

1981	April	8-10	University of Tennessee, Knoxville
1982			Eastern Kentucky University, Richmond
1983			University of Southwestern Louisiana, Lafayette

PATRONS

Carolina Biological Supply Company; Burlington, NC
Parco Scientific Company; Vienna, OH
Fisher Scientific Company; Chicago, IL
Olinkraft, Incorporated; West Monroec, LA
Beckman Instruments, Incorporated; Norcross, GA

COPY DEADLINES

July Issue: May 15
October Issue: August 15
January Issue: November 15
April Issue: January 1

Abstracts of Papers Presented at the 41st Annual Meeting of the Association of Southeastern Biologists

(1)

Passage of Host Serum Macromolecules Across the Digestive Tract of the American Dog Tick, *Dermacentor variabilis* (Say)

STEVE ACKERMAN, THOMAS W. MCGILL AND
F. BRIAN CLARE
Old Dominion University

The ability of host macromolecules to pass across the digestive tract into hemolymph or female ticks was investigated. Electrophoretic and immunologic analyses detected various serum constituents in hemolymph following infestation on rats or rabbits or following artificial feeding of whole serum or purified serum substances. The effects of digestion and/or transport of these macromolecules on protein structure and antigenicity was examined. Furthermore, host antibodies were detected on salivary glands or ovaries dissected from ticks infesting rabbits immunized with extracts of these organs. No antibodies were detectable on 1) organs from ticks infesting a non-immunized rabbit, 2) salivary glands from ticks infesting a rabbit immunized with ovary extracts, or 3) ovaries from ticks infesting a rabbit immunized with salivary gland extracts. The implications of this ability of antibodies directed against internal organ antigens to pass across the tick's digestive system, while retaining specific antibody activity, will be discussed with regard to the development of an anti-tick vaccine.

(2)

The Possible Involvement of Microsomal Oxidases in Teratogenesis

L. A. ADAMCHAK AND C. A. MANEN
University of Alabama

Cleft palate can be produced in mice in response to treatment with a variety of glucocorticosteroids, i.e., hydrocortisone. The magnitude of this response seems to be dependent upon the induction or non-induction of aryl hydrocarbon (benzo (a) pyrene) hydroxylase (AHH), a microsomal drug metabolizing enzyme. Mice which are genetically AHH non-responsive (DBA/2) have high percentages (90%) of cleft palate production in response to hydrocortisone treatment. Those mice which are AHH responsive (C57BL/6J) exhibit a decreased response to hydrocortisone. Treatment of random bred AHH responsive mice (CD1) also result in low percentages of cleft palate. Perturbation of the AHH system in the random bred mice results in the appropriate modification of the cleft palate percentages. Supported by the University of Alabama Venture Fund Grant #1-6-05-1123-01.

(3)

The Use of Diagnostic-Prescriptive Testing in an Introductory Biology Course

WENDA J. ADAMS AND JOHN R. MEYER
North Carolina State University

This paper reports on the use of a sequel of Concept Mastery Tests in the Introductory Biology course at North Carolina State University.

These tests diagnose the student's progress, and an analysis sheet prescribes the information that the student needs to study in preparation for a course examination. Use of the tests is completely based on the student's initiative since the tests are optional and offer no credit in the course. The results of various research studies conducted by the authors have indicated the effect of this type of testing on achievement and the type of student who elects to use this learning aid.

(4)

Sensitization of Murine Spleen Cells During Pregnancy Against a Methylcholanthrene-induced Tumor

LINDA R. ADKISON AND JOSEPH H. COGGIN, JR.
University of South Alabama

Lymph node cells and spleen cells from multiparous females have previously been shown to be cytotoxic against tumor cells possessing surface embryonic antigens without any investigation into the degree of sensitization of the cytotoxic cells during pregnancy or the effect of parity on sensitization of cytotoxic cells. Adoptive transfer assays show that spleen cells from pregnant female mice are cytotoxic against methylcholanthrene-induced tumor cells (MCA-1315) whereas spleen cells from male and virgin mice are not. These spleen cells are most cytotoxic to the tumor cells during days 10 to 14 of gestation and spleen cells from multiparous females show a greater cytotoxic capacity than do those from primiparous females. Increasing the ratio of spleen cells to tumor cells used in adoptive transfer assays from 100:1 to greater than 5000:1 increased cytotoxicity from 37 to 87%. Supported by the National Cancer Institute, Grant CA22674 and the Department of Energy, Contract EE-77-S-05-5601.

(5)

Fishing Quality of the St. Louis Urban Fishing Program

STEVEN R. ALCORN

Missouri Department of Conservation

Due to increased transportation costs, recreational fishermen are utilizing their local aquatic resources to a greater degree than in the past, rekindling agency interest in urban fishing programs. The St. Louis urban fishing program has been in operation for 10 years. To determine the quality and effectiveness of the program, urban fishermen were interviewed for a two year period. Results of angler interviews have implications for future urban fishing programs. Fishing pressure at urban lakes is high and can exceed 4,000 hrs/ha. Correspondingly, harvest rate is also high. Urban fishermen have definite species preferences and place importance on catching preferred fish. Fish size and number of fish caught are also important. Catch diversity is of moderate importance and the practice of catch and release has little value to urban fishermen, although it occurs frequently. Trip quality is influenced by frequency of fish stocking, species stocked and species catchability.

(6)

Comparative Megasporogenesis and Megagametogenesis of *Eustachys petraea* and *E. glauca* (Gramineae)

CYNTHIA AULBACH-SMITH

University of South Carolina

The ovule in *Eustachys* is bitegmic, tenuinucellate and amphitropous with the micropyle oriented toward the base of the locule. The megasporocyte forms directly by enlargement from the hypodermal archesporial cell and undergoes meiosis I to produce the dyad. Meiosis II occurs non-synchronously with division initiating first in the larger chalazal dyad member. The resulting tetrad may be linear, T-shaped or modified T-shaped. The chalazal megaspore functions in megagametogenesis producing the eight-nucleate megagametophyte by three successive mitotic divisions. Prior to fertilization the synergids degenerate, the polar nuclei fuse and the antipodals undergo a secondary increase in number, producing as many as twelve cells. Statistical analyses of cellular lengths and nuclear volumes indicate some difference between the two species. In addition, variation in the differentiation of the mature megagametophyte indicates a significant difference between the two species.

(7)

Thermoregulatory Behavior of the Turks and Caicos Islands Rock Iguana, *Cyclura carinata*

DAVID L. AUTH

University of Florida

Mean field, regulating phase T_b , determined by long-term, radiotelemetric monitoring, ranged from 38.0 to 39.7 C. Heliothermia was coupled with stenothermia;

regulating phase T_b ranges averaged only 3.3 C. Iguanas were strictly diurnal and active all year. They usually did not emerge from their burrows until T_b would rise and submerged at T_b 's averaging 10.3 C higher than at emergence. Individual mean minimum T_b was highly correlated with mean maximum T_b , as was intraindividual change in maximum vs. minimum T_b per day, the linear regression lines extrapolating to approximately the maximum voluntary tolerance. Placement of three transmitters on penned iguanas permitted analysis of dorsal and ventral heat transfers. Individuals were thigmothermic only 20.7 percent of the time, nearly half during the short morning heating phase. With air and substrate temperatures and radiant heat input controlled, body conformational and orientational changes were determined photographically as T_b increased. Evidence suggests that iguanas regulate surface T_b : 1) core T_b 's at sun and shade seeking and panting were all depressed at midday, 2) maximum T_b during an overcast period was commonly higher than the preceding maximum, 3) the T_b at escape to shade during radiant heating increased as substrate temperature increased and 4) maximum T_b per day commonly occurred late in the afternoon.

(8)

A Contribution to the Life History of *Conopholis americana* (L.) Wallroth (Orobanchaceae)

WM. VANCE BAIRD AND JAMES L. RIOPEL

University of Virginia

LYTTON J. MUSSLEMAN

Old Dominion University

Germinated seeds and seedlings attached to mycorrhizal roots of oak are described for *Conopholis americana* for the first time. A sequence for establishment and early development of *Conopholis* on its host is given. Our observations are consistent with other reports in the literature that *Conopholis* parasitizes only *Quercus* spp. Information is presented, relating size of host root with position of parasite attachment, which shows that a significant difference in host root diameter is developed from the proximal to the distal side of the infection. Necrosis of the *Conopholis* tubercle is also discussed. Field observations show that the tubercle appears to die back in a proximal to distal order. Regeneration of the tubercle was also observed, first appearing in that portion of the tubercle which underwent the earliest necrosis.

(9)

Herbaceous Vegetation of the Floodplain Forest at Horseshoe Lake, Alexander County, Illinois

C. C. EAKER, JR. AND P. A. ROBERTSON

Southern Illinois University, Carbondale

The herb stratum of the floodplain forest on Horseshoe Lake Island in southern Illinois was studied to determine species distributions along the moisture gradient and to determine species relationships to soil-site variables and overstory. During the 1978-79 growing season 37 species were sampled, four of which comprised 96% of the cover variance. These four are *Athyrium*

pycnocarpon, *Laportea canadensis*, *Boelimeria cylindrica* and *Saururus cernuus*. Significant correlations occurred between *Laportea canadensis*, *Athyrium pycnocarpon*, *Ozmorhiza longistylis* and *Saururus cernuus* and the presence of mottling, depth and duration of flooding, and elevation. Significant associations were also found between *Acer saccharum*, *Ulmus rubra* and *Platanus occidentalis* in the overstory and *Laportea canadensis*, *Ozmorhiza longistylis* and *Bidens aristosa* in the herb stratum. Coenoclines show a high degree of similarity between the herb distributions of Horseshoe Lake and those of Little Black Slough 80 km distant.

(10)

Determination of Nucleic Acid Ratios in *Hygrophorus* sp.

S. K. BALLAL

Tennessee Technological University

Field collected *Hygrophorus* sp. was brought into multispore culture and grown in potato dextrose-yeast extract liquid medium for twenty-one days. The harvested mycelium was buffered and sonicated for cell disruption and homogenization. The homogenate was centrifuged at 6000 X g in cold 0.6 N HClO₄. Schmidt-Thannhauser method was used for RNA/DNA determinations, and the fractions were read at absorbance at 260 nm. Preliminary results from the ongoing research indicate that RNA/DNA determinations are valid indicators of growth, and the ratios remain constant until the production of clamp formation indicating that the nucleic acid ratio levels off at the time of basidiocarp formation. The use of biochemical techniques in the past has provided additional criteria for characterizing taxa defined by conventional morphological, cytological, and cultural observations. The determination of RNA/DNA ratios of closely related taxa might be of some help in delineating the taxonomic relationship among these organisms.

(11)

Dose-Response Avoidance Patterns of UV-B Irradiation

JEANNE A. BARCELO AND JOHN CALKINS

University of Kentucky

Laboratory studies have shown that numerous organisms can detect and avoid simulated solar UV-B (= 280-320 nm), the most biologically injurious component of sunlight. Organisms were allowed to move freely between two areas, one region exposed to UV-B, the other area of equal irradiance but lacking the UV-B component. The dose-response movements of two arthropods (i.e., an aquatic copepod and a terrestrial mite) were observed when exposed to various intensities of ultraviolet light. The two arthropods showed distinctly different avoidance patterns. One organism showed an avoidance pattern in which the rate of movement out of UV was highly dependent on UV-B intensity and reached an equilibrium level independent of dose-rate. The other organism showed a pattern which was nearly the opposite. Models were developed to analyze the avoidance kinetic data.

(12)

A Comparison of Holding Procedures Under Rising and Falling Temperatures of Temperature Preference in *Notropis Cornutus* (Mitchell)

THERESA Y. BARILA, JAY R. STAUFFER, JR. AND

CHARLES H. HOCUTT

Appalachian Environmental Laboratory

The temperature preference of *Notropis cornutus* (Mitchill) was examined following three holding procedures: direct testing after field collection; fifteen days acclimation to a constant temperature regime; and fifteen days acclimation to a diel temperature regime based on actual field fluctuations. Acclimation temperatures were 6, 12, 18, 24, 30 and 33 C. Temperature preference under rising (January to July) and falling (July to December) field conditions was compared following the three holding procedures. Linear, quadratic and semi-log models were used to determine the relationship between acclimation temperature and preference temperature to predict the final temperature preference.

(13)

Role of Temperature and Photoperiod in Regulating the Timing of Germination and Flowering in the Winter Annual, *Bromus japonicus*

JERRY M. BASKIN AND CAROL C. BASKIN

University of Kentucky

From the time of seed maturity in late June and early July until December, habitat temperatures are within the range of those required for germination. However, a large proportion of the seeds in a given seed crop do not germinate in autumn of the year they are produced because they are not dispersed until winter. A high percentage of the winter-dispersed seeds is induced into dormancy and must afterripen the following summer before they can germinate the next autumn. Thus, many of the plants that become established at a population site in autumn are from the previous years' seed crop. Plants overwinter in the field as "rosettes" and require long days for flowering. Nonvernalized plants exposed to short photoperiods of late autumn and winter flower under long days in spring, but plants flower sooner if they are subjected to both low temperatures and short photoperiods during winter.

(14)

Effects of Thyroid Hormones on DDT Distribution and Excretion in the Rat

T. R. BAUMAN AND G. G. WEINACKER

University of Alabama

The effects of exogenous administration of thyroid hormones on the distribution of DDT in male rats was studied. The rats were injected with DDT, then randomly divided into three groups and injected for five days as follows: Group I received saline; Group II received 5.0 µg T3/100 gbw; and Group III received 25.0 µg T3/100 gbw. Urine and feces were collected during

the five day post-DDT treatment and analyzed for DDT content. The rats were sacrificed six days post-DDT treatment and organ distribution of DDT was determined.

(15)

Photosynthesis in *Cryptomonas ovata*
(Cryptophyceae) as a Function of the Osmotic
and Ionic Composition of the Assay Solution

WILLIAM BEARD AND BAILEY WARD
University of Mississippi

We have studied features of oxygen evolution in *Cryptomonas ovata* (UTEX Strain 358) as a function of pH buffers and pH, osmotic strength of assay solution, and quality and quantity of monovalent cations. Six commonly used hydrogen buffers (at 50 mM) were tested. Cells in N-tris (hydroxymethyl)-2-aminoethanesulphonic acid (TES) buffer (pH 7.4) consistently evolved oxygen at rates of 600 to 700 μ equivalents mg^{-1} chlorophyll $a \text{ h}^{-1}$. Up to 20% inhibition of oxygen evolution was observed for cells in tris (hydroxymethyl) aminomethane (Tris) buffer (pH 8.15); up to 80% inhibition was observed in sodium phosphate buffer (pH 7.2), N-tris (hydroxymethyl)-methylglycine (Tricine) buffer (pH 8.05), and sodium citrate buffer (pH 5.0). Complete inhibition was observed when cells were suspended in sodium acetate buffer (pH 5.0). Cells suspended in 50 mM mannitol at pH values ranging from 5 to 8 gave oxygen evolution rates comparable to those of cells in TES. High rates of oxygen evolution (600 to 700 μ equivalents mg^{-1} chlorophyll $a \text{ h}^{-1}$) were exhibited by cells suspended in mannitol at concentrations ranging from zero (distilled water) to 150 mM. Both sodium and potassium ions (at 10 mM) inhibited oxygen evolution. Results of experiments designed to determine the sites of the above described inhibition will be discussed.

(16)

A Multivariate Analysis of Forest
Communities of the Reed Brake Research
Natural Area, Alabama

SCOTT W. BECKETT AND MICHAEL S. GOLDEN
Auburn University

The organization of forest vegetation into communities and the relationship of these communities to site characteristics and disturbance history were explored using multivariate techniques. Data were from 81 plots on a 600 acre area in the Hilly Coastal Plain of Alabama. First, two agglomerative clustering techniques, supplemented by similarity sorting, were used to identify forest community types. Next, discriminant analysis was used to verify the distinctiveness of the types and to generate discriminant functions. Finally, the types were ordinated using both reciprocal averaging and canonical analysis, and the resulting patterns compared to site characteristics.

(17)

Some Ecological Observations of the Arborescent
Vegetation, Hughes Island, Florida

PAUL BIELLING
Ft. McCoy, Florida

ALBERT LAESSLE
University of Florida

RICHARD STALTER
St. John's University

Hughes Island, located within the Ocala National Forest, Florida, supports some of the largest *Gordonia lasianthus* and *Magnolia virginiana* in the United States. The arborescent vegetation of Hughes Island was sampled by the point centered quarter method during January, 1979 and density, relative density, frequency, relative frequency, basal area, relative dominance and importance value were calculated. *Gordonia lasianthus* was dominant with *Nyssa biflora* the most important associate. One giant *Gordonia*, the National Champion Tree, was 49 inches DBH while several *Magnolias* approached 24 inches DBH. Hughes Island's remoteness probably accounts for its undisturbed state and the unusual stature of its trees.

(18)

Seasonal Changes in the Amphipod Fauna of
Sponges Found in a South Carolina
Saltmarsh Creek

CHARLES K. BIERNBAUM
College of Charleston

For two years sponge samples were collected from subtidal shell debris in a North Edisto River, South Carolina, saltmarsh creek and associated amphipods identified. Dominant spongiicolous amphipods were *Colomastix halichondriae* Bousfield, *Leucothoe spinicarpa* (Abilgaard), *Corophium simile* Shoemaker, *Corophium acherusicum* Costa, *Lembos* cf. *L. websteri* Bate, and *Melita appendiculata* (Say). Densities of amphipods in *Microciona prolifera* and *Halichondria bowerbanki* usually exceeded those in *Lissodendoryx isodictyalis* and *Haliclona loosanoffi*. Seasonal changes in amphipod dominance were, however, approximately the same in these sponge species. Winter dominance by *Corophium* spp. and on occasion *Lembos* spp., was followed by spring dominance by *Melita appendiculata* and summer dominance by *Colomastix halichondriae*. With some exceptions during the winter, amphipod density in *Microciona prolifera* (the most consistently occurring sponge species) generally decreased as sponge size increased.

(19)

Electrophoretic Analysis of Genetic Variability
between Hatchery and Wild Populations of
Salmo gairdneri (Salmonidae)
in West Virginia

KERRY D. BLEDSOE AND DONALD C. TARTER
Marshall University

West Virginia has supported a propagation program for rainbow trout, *Salmo gairdneri* Richardson, since 1920. During its 60 years of operation, no biochemical genetic studies have been done on West Virginia rainbow trout. Management of trout can be improved when based on a more thorough knowledge of their genetics. A genetic analysis of four hatchery stocks and four wild populations of rainbow trout were assayed using starch gel electrophoresis. Rogers coefficient, a statistical test of similarity, was computed from data on 11 enzymes representing an estimated 21 loci. Variation of hatchery populations is discussed and compared with wild populations.

(20)

The Eastern Cottonmouth at the Northern Edge
of its Range: Fat Cycles

CHARLES R. BLEM
Virginia Commonwealth University

Seasonal and sexual variation of fat bodies were examined as part of a long-term study of the ecology of the eastern cottonmouth, *Agkistrodon piscivorus*, at the northern edge of its range (Hopewell, Virginia). Significant intersexual and temporal variation was detected in weight of fat bodies. Fat index (g fat/g non-fat weight) does not differ between sexes but varies monthly. Absolute quantities of fat are highly correlated with snout-vent length. Fat index has a very low, but significant, correlation with snout-vent length. Cottonmouth fat bodies contain very little non-fat material and lean dry weight of the fat body increases only 0.02 g per g increase in dry weight. This indicates that fat deposition involves little, if any, synthesis of new cells. Fat deposition is likewise accompanied by little addition of water. The caloric content of cottonmouth lipid (9.23 Kcal/g) is used to estimate seasonal energy reserves. Large amounts of surplus energy may be related to high rates of reproductivity among female Hopewell cottonmouths.

(21)

Old Field Vegetation in Southeastern Kentucky

ARTHUR R. BOEBINGER AND WILLIAM H. MARTIN
Eastern Kentucky University

The bottomlands at Lilley Cornett Woods are old pastures that have been abandoned seven years. They were sown in perennial grasses in 1957; prior to that time they had been under rowcrop cultivation. In 1979, permanent plots were established in three fields in a modified grid pattern. Composition and estimates of species cover were recorded throughout the growing season. *Festuca arundinacea* and *Panicum clandestinum*

are the dominant grasses although goldenrods become the dominant herbaceous cover from mid- to late summer. Invading tree species are *Pinus virginiana*, *Liquidambar styraciflua* and *Liriodendron tulipifera*. Invasion rate may be slower than expected for this region because of the persistence of the pasture grasses and the wetness of the sites.

Compositional comparisons will be made with other successional fields in the southeast because studies of old-field vegetation in Kentucky are virtually non-existent. The establishment of permanent plots permits monitoring of tree species invasion and rate of forest development in habitats that have high production potential on the dissected Cumberland Plateau.

(22)

Ultrastructure of *Myxobilatus* sp.
(Protozoa: Myxosporida) in the Largemouth
Bass, *Micropterus salmoides*

O. J. BOOKER AND W. L. CURRENT
Auburn University

Scanning electron microscopy revealed that vegetative stages (plasmodia) were firmly attached to the surface of the urinary bladder. Transmission electron microscopy of the species-to-species interface revealed that plasmodia possess numerous pseudopodia which were inserted into channels formed by infoldings of the host cell membrane. Formation of the channels appeared to be parasite induced. Topography of the unattached surface of the plasmodium is that of fine, branched microvilli which project into the lumen of the urinary bladder. Smaller plasmodia, floating freely within the urinary bladder, are apparently derived from the larger, attached plasmodia by a budding process. Due to the extreme osmophilic nature of the parasite, resolution of internal structures of plasmodia by standard EM techniques is very difficult. Studies are now underway to resolve this problem and to reconstruct some of the cellular events of sporogenesis.

(23)

Successional Relationships of Vines in Temperate
and Tropical Forests

LINDSAY R. BORING AND CHRIS WOHLERS
University of Georgia

Following disturbance of a temperate deciduous forest in North Carolina, three genera of vines (*Vitis aestivalis* (Michaux var. *argenteifolia* (Munson) Fernald, *Parthenocissus quinquefolia* (L.) Planchon, and *Smilax* spp.) comprised a significant percentage of the successional NPP with the former two species dominating up to 40% of the NPP in localized patches. Old damaged vines of *V. aestivalis* sprouted 634 adventitious stems per ha, and 19,000 seedlings per ha germinated from dormant seeds present in the forest floor. In an adjacent mature forest, there were only 13 stems per ha between 2.5-10 cm dbh, and no individuals smaller than 2.5 cm dbh. This species does not reproduce in the mature forest but is dependent upon disturbance for establishment and initial growth. *V. aestivalis* climbs by grasping small stems with tendrils, and maintains a high ratio of photosynthetic tissue to support tissue in comparison to other woody species. The high ratio permitted annual shoot growth

of up to 7.5 m, resulting in efficient competition with other woody species for light.

Vines growing on disturbed sites sampled in Costa Rican tropical wet forest and montane rain forest also predominantly utilized twining or tendril-climbing adaptations. Mature stands were dominated by members of the Araceae and other species with root-holdfast and tendril-sucker climbing adaptations. This supports the hypothesis that many lianes are dependent upon disturbance for initial growth and canopy establishment.

(24)

Tree Ring Study of Baldcypress in the Barataria Basin, Louisiana

LYNNE JORDAN BOWERS
Louisiana State University

A dendroecological study using baldcypress (*Taxodium distichum* (L.) Rich.) is presently being conducted in the swamp forest of the Barataria Basin, Louisiana. The goal of the study is to use tree ring data to identify the environmental factors which influence the variation in stem wood production. A recently completed pilot project to determine the type and number of samples to be collected also supported a previous assumption made about the homogeneous nature of the site. Ongoing findings will be discussed.

(25)

Life Forms of Southeastern Vegetation

ELGENE O. BOX
University of Georgia

Vegetation-environment studies have traditionally employed mainly taxonomic and formation units of vegetation. More useful ecologically would be an approach involving ecophysiological groupings called life forms, which represent similar ecological requirements due to similar form-based water and energy budgets. Not only would attempts to relate general life form to environmental conditions relate more closely to actual environmental-limitation processes, but also the combinatorial basis permits greater resolution in discrimination of different vegetation types.

The usefulness of the life-form approach was studied initially using a predictive world model involving 41 terrestrial life forms (with subdivisions) and their estimated macroclimatic limits (ecoclimates). The approach is now applied to the American Southeast in order to study local vegetation diversity and to assess model utility limits by comparing predicted and actual vegetation at local scales. Accuracy at both world and local scales appears to be around 80% for dominant and sub-dominant forms.

(26)

Microscopic Viewing Techniques for the Visually Handicapped Biologist

CAROLYN F. BRADLEY AND KENNETH S. RICKER
Tift College and University of Georgia

During a study of instructional strategies involving use of the microscope, the authors developed several

microscopic viewing techniques appropriate for use by visually handicapped individuals, whether students or professional biologists. These techniques utilize instrumentation or devices that are readily available and will be described and illustrated.

(27)

The Hepaticae of Peninsular Florida

DAVID A. BREIL
Longwood College

Hepaticae have been collected throughout the many ecological habitats of peninsular Florida for the past twelve years in preparation of a manual for this flora. The taxa include one hundred thirty-six species in forty-nine genera. Sixty-three percent (86 species) have strong tropical affinities, the majority being in the families Lejeuneaceae and Plagiochilaceae. The manual in preparation will include keys to the taxa, species illustrations and descriptions, and ecological information.

(28)

Aggression and Mating Success in the Forked Fungus Beetle

LUTHER BROWN
George Mason University

Forked fungus beetles (*Bolitotherus cornutus* (Panzer)) inhabit polyporoid bracket fungi. They are relatively sedentary and rely on fungal brackets for food, as well as living and oviposition sites. Unlike females, males possess a pair of horns. Horn size is highly variable, ranging from 8 to 31 percent of the total length of the animal. Males use their horns during aggressive encounters to interrupt mating pairs and to dislodge rivals from fungal brackets. Experimental pairings of large and small horned males demonstrate that larger horned males have greater access to fungal brackets and court and mate with females more frequently than do smaller horned males. Horn and body size are not independent, however, and may both affect the outcome of aggressive encounters.

(29)

Correlation of the Relative Lipophilicity of Novel Thiazoles and Their Biological Activity in Whole Cell and Cell-Free Systems

R. A. BROWN
Western Kentucky University

K. D. BERLIN AND N. N. DURHAM
Oklahoma State University

Substituted 2-amino-thiazoles were screened for biological activity against *Pseudomonas fluorescens*, *Bacillus subtilis* and *Tetrahymena pyriformis*. The most active compounds against *B. subtilis* and *T. pyriformis* were the methoxy substituted compounds. The hexyloxy substituted compounds showed little or no activity. None of the compounds were active against *P. fluorescens*. The methoxy substituted compounds also inhibited up-

take of D-glucose, uracil, DL-alanine and DL-serine in *B. subtilis*. Thermal denaturation studies using DNA isolated from *P. fluorescens* and *B. subtilis* showed all the substituted thiazoles capable of binding DNA and influencing denaturation. Substitution of the hexyloxy and methoxy groups at position 7 alters the lipophilic nature of the compounds as determined by chromatographic R_m values. The methoxy compounds are more hydrophilic and showed greater activity against whole cell systems, the hexyloxy compounds are more lipophilic. There was no correlation between lipophilicity and cell-free systems.

(30)

A New Liverwort from High Altitudes in Costa Rica

JAMES G. BRUCE
University of Georgia

An unusual liverwort apparently related to *Riccardia* and *Cryptothallus* (Metzgeriales, Aneuraceae) was discovered in the high altitude, *Chusquea* dominated areas in the mountains of central Costa Rica. It is a thick thalloid organism which grows partially covered by humic materials. Although lightly green, it possesses a conspicuous development of endophytic fungi restricted to a definite basal zone. Starch storage is pronounced. The gametangia appear similar to those described for *Riccardia* and *Cryptothallus*. The calyptra surrounding the developing sporophyte is massive, fleshy and smooth. No elaterophore is present. Exserted sporophytes were not observed.

(31)

The Sharphead Darter, *Etheostoma acuticeps* (Percidae)

RICHARD T. BRYANT
University of Tennessee

A study of the sharphead darter was conducted to determine both its life history and its feeding habits relative to both syntopic species and other members of the subgenus *Nothonotus*. Information from this and other studies shows that *Etheostoma acuticeps* differs from other *Nothonotus* (*E. maculatum*, *E. camurum* and *E. rufileatum*) and from the darters most commonly found with it (*E. zonale* and *E. blennioides*) in its heavy reliance on the larvae of Simuliidae and Baetidae as prey, rather than Chironomidae. *E. acuticeps* breeds from late June until mid-August, the eggs apparently being buried in sand between rocks. Fecundity approaches 300 eggs in the larger females. The darters live to an age of 3 years, the largest reaching 70 mm SL. Sharphead darters inhabit the swiftest portion of riffles with a rubble and boulder substrate, usually well encrusted with *Podostemum*. Current distribution includes the Nolichucky, Cane and possibly South Fork Holston rivers.

(32)

Recent Findings on the Fishes of Northern Georgia

R. T. BRYANT, D. A. ETNIER AND T. A. FARMER
University of Tennessee

Recent fish collections in northern Georgia have yielded several major discoveries, particularly in the upper Coosa River system. *Noturus munitus*, already known from the Conasauga River in Tennessee, was collected at several sites on the Etowah River, adding this species to the fauna of Georgia. *Ericymba buccata*, *Notropis lutipinnis* and *Ictalurus brunneus* were also collected in the Etowah, representing the first collections of *N. lutipinnis* and *I. brunneus* in the Mobile River basin, and the first collection of *E. buccata* in the Mobile system above the Fall Line. All three are found in the adjacent Chattahoochee River and presumably gained access through headwater capture. The first records of *Percina lenticula* since 1950 in the upper Coosa system were made in both the Etowah and Conasauga rivers. Significant range extensions in the Conasauga River for *Percina antesella*, *Etheostoma trisella* and two undescribed darters result in their addition to the fauna of Georgia. Additional findings are anticipated.

(33)

Relationship Between Habitat and Incidence of Black Spot Disease (Trematoda: Strigeida) in Stream Fishes

FRANK J. BULOW AND RONALD C. HOOPER
Tennessee Technological University

A total of 2195 fish, representing 15 species and 6 families were collected from a northcentral Tennessee stream system and examined for black spot metacercarial cysts. Recorded data included cyst location on the body and intensity of infection. Incidence of infection and intensity of infection were compared to stream order, specific habitat type and habitat preference of the various fish species. Incidence and intensity were lowest in species preferring swift current, and infections were generally lighter in areas characterized by swift current. These relationships and their implications are discussed.

(34)

Plant Succession on Certain Granitic Outcrops in Georgia

MADLINE P. BURBANCK
Emory University

First studied in 1957, thirty-seven island communities on granitic rock outcrops in the Lithonia, Georgia area (Piedmont Plateau) were re-examined in 1968 and 1976 as to floristic composition and maximum soil depth, and photographs and field notes have been taken at irregular intervals from 1957 to the present. The shallow soil *Diamorpha* communities have remained unchanged floristically and maximum soil depths have varied only slightly. Excluding the four *Diamorpha* communities and three atypical communities observed for general informational purposes, seventeen of thirty island communities showed successional changes in their floristic

makeup confirming the earlier hypothesis that Lichen-annual, Annual-perennial and Herb-shrub communities are stages in succession. Over time and with increases in maximum soil depths from 1-12 cm, two Lichen-annual communities became Annual-perennial communities, four Annual-perennial communities progressed to Herb-shrub stage, and eleven additional communities including four Herb-shrub communities showed some successional changes in floristic composition. The presence of mature pine trees (*Pinus taeda*) in three Herb-shrub communities may indicate that a Shrub-tree stage is the edaphic climax for island communities on granitic rock outcrops.

(35)

Systematic Studies in *Begonia* Section *Gireoudia* (Kl.) A. DC

KATHLEEN BURT-UTLEY
University of New Orleans

Begonia L. (Begoniaceae) is a large, pantropical genus of predominantly monoecious species. Because of its size (± 1400 spp.) and complexity, floristic treatments of *Begonia* do not present a complete picture of the included taxa. Although many of the sections in *Begonia* are morphologically and geographically cohesive, little attention was paid to their systematic value until the present research in section *Gireoudia* (Kl.) A. DC. Section *Gireoudia* is a natural group of 40 species distinguished from other *Begonia* sections on the basis of habit and floral morphology. The section ranges from central Mexico to northern South America, but individual species have more restricted distributions. The majority of species occur on forested slopes or in wooded areas near streams in mountainous regions between 400 m and 2000 m elevation. The present revisionary study in section *Gireoudia* has demonstrated that intensive investigation of species at the sectional level offers a unique opportunity for meaningful systematic research in *Begonia*.

(36)

Seasonal Effects of Once-Through Power Plant Chlorination on Several Estuarine Macroinvertebrates

D. T. BURTON, S. L. MARGREY AND L. W. HALL, JR.
Benedict Estuarine Research Laboratory

The interactions of total residual chlorine (TRC), elevated temperature (ΔT) and exposure duration were evaluated for spring (15 C) and summer (21-27 C) acclimated juvenile blue crabs (*Callinectes sapidus*), amphipods (*Gammarus* sp.), grass shrimp (*Palaemonetes pugio*) and opossum shrimp (*Neomysis americana*) exposed to various power plant operating conditions. The organisms were exposed to TRC concentrations up to 0.3 mg/l and ΔT 's up to 10 C for exposure periods up to 4 h. After each exposure period, TRC concentrations were decayed over a 1- to 1.5-h period to < 0.01 mg/l. Temperatures were decayed over a 4-h period to 2 C above ambient.

Percent mortality models for TRC, ΔT and exposure duration effects on the organisms 48- to 96-h after exposure showed that: 1) blue crabs were not affected by any single factor or combination of factors at either

acclimation temperature; 2) TRC was found to be the dominant factor which caused mortality to both amphipods and grass shrimp while ΔT and exposure duration were less important; 3) TRC and ΔT were both important in causing mortality to opossum shrimp at the lower temperature in contrast to ΔT which was the dominant factor at the warm temperature and 4) more mortality occurred to amphipods, grass shrimp and opossum shrimp at summer temperatures than at spring temperatures. Supported by the Potomac Electric Power Company.

(37)

Analysis and Structure of an *Acer saccharum* (Aceraceae) Forest in Northeastern Illinois

CHARLES L. BUSHEY
Southern Illinois University, Carbondale

An old-growth forest dominated by *Acer saccharum* in Lake County, Illinois, was studied to provide baseline data on an Illinois Nature Preserve (Ryerson Conservation Area). Density of the stand is 472.3 stems/ha with a basal area of 36.6 m²/ha. *Acer saccharum* provided 56.7% of the stand density (268.1 stems/ha) and 48.0% of the basal area (17.6 m²/ha). Seventeen other species comprised the richness of the overstory. The size-class distribution exhibited a balanced or all-sized (aged) distribution as indicated by a significant fit to the negative power function ($r = 0.72$). Sapling and seedling abundances indicate a trend of increasing *A. saccharum* density resulting from the decline of *Ulmus rubra* and *U. americana* due to Dutch elm disease. Growth increments for the past 100+ years for *A. saccharum* and lesser time periods for other hardwoods revealed consistent high growth rates in canopy trees. Scattered clusters of certain species suggests gap-phase replacement is important in stand regeneration.

(38)

Trophic Relationships of Two Sympatric Fishes, *Cynoscion arenarius* and *C. nothus* (Pisces:Sciaenidae), in the North Central Gulf of Mexico

STEVEN M. BYERS AND STEPHEN T. ROSS
University of Southern Mississippi

Cynoscion arenarius and *C. nothus* were collected in the Mississippi Sound and the Gulf of Mexico off Mississippi during 1978-1979. *Cynoscion arenarius* ranged in size from 42 to 305 mm SL and *C. nothus* from 44 to 212 mm SL. Fish and crustacean prey dominated the diets of both species at all sizes over all seasons. Smaller specimens (< 50 mm) of *C. nothus* preyed exclusively on crustaceans, primarily mysid shrimps but also gammarid amphipods. Stomachs of small *C. arenarius* contained largely fish material, though the significant volume of crustacean prey in the next larger size class suggests that crustacean prey are probably also important to the smaller fish. At sizes greater than 50 mm, fish prey (primarily Engraulidae) volume greatly exceeded that of crustacean prey for both species. Though there is extensive sharing of prey categories by these seatrout, the degree of utilization is apparently quite different. Total diet comparison by Spearman

Rank Correlation supports this idea and suggests that these similar sciaenids may be segregating trophically.

(39)

Demographic Parameters of Two Populations of the Ornate Chorus Frog, *Pseudacris ornata*

JANALEE P. CALDWELL AND RAYMOND D. SEMLITSCH
Savannah River Ecology Laboratory

Certain aspects of the demography of the Ornate Chorus Frog, *Pseudacris ornata*, were studied in two populations breeding on the Savannah River Plant in Aiken, South Carolina. Both ponds were completely encircled by drift fences, and frogs were captured and individually marked as they moved into the ponds to breed. Many were later recaptured as they left the breeding sites. The breeding period lasted approximately 10 weeks. The sex ratio did not differ from 1:1 in either population. In one population, males entered the pond before females and tended to spend longer in the ponds. The sex ratio of exiting frogs in one population is skewed in favor of females suggesting that males may have a higher mortality rate than females during the breeding season. Data on juvenile recruitment, growth rates, age at first reproduction, and longevity are also being analyzed.

(40)

The Specific Status of *Sedum glaucophyllum* Clausen (Crassulaceae)

PATRICK J. CALIE
University of Tennessee

Considerable confusion has been generated concerning the taxonomic status of *Sedum glaucophyllum* Clausen, i.e., whether it is a variety or a synonym of *S. nevii* Gray (a rare endemic of the southern Appalachians) or a distinct species. Phytochemical and SEM investigations were undertaken to resolve this problem. Thirteen flavonoid compounds were isolated and identified from leaf and stem tissues utilizing UV/visible light spectrophotometry. Kaempferol, quercetin and apigenin mono- and diglycerides were present in addition to a quercetin-3-O-methyl ether. Three compounds were present only in *S. nevii* and one was found only in *S. glaucophyllum*. An SEM examination of the basal rosettes of the two taxa revealed that the leaves of *S. glaucophyllum* have papillose margins. In contrast, the leaves of *S. nevii* possess smooth margins. These data, in conjunction with those obtained by an SEM study of seed coat ornamentation, support the contention that *S. glaucophyllum* is a sound taxonomic species.

(41)

The Effects of Contour Surface Mining on Aquatic Macroinvertebrates in Eastern Kentucky

SAM M. CALL
Kentucky Nature Preserves Commission

Quantitative and qualitative samples of the macroinvertebrate communities were taken twice in 1978 from fifty eastern Kentucky streams. These sites were located

in second through seventh order streams which were classified as either high quality, moderately degraded or degraded. Siltation resulting from surface mining operations appeared to be the most severe impact on the macroinvertebrate community. Species diversity, equitability and total number of taxa decreased as surface mining perturbations increased. Certain taxa appeared to have a greater tolerance to strip mining activities than others; therefore, an attempt has been made to classify the macroinvertebrates into one of three categories (tolerant, facultative and intolerant).

(42)

Effects of Simulated Acid Rain on the Uptake and Accumulation of Cadmium and Zinc in *Pinus strobus* L.

CLAIRE L. CARLSON AND HARVEY L. RAGSDALE
Emory University

Pinus strobus L. seedlings, potted in zinc-cadmium amended Norfolk loamy sand soil, were treated with solutions at four pH levels — 5.3, 4.0, 3.0 and 2.0 — for 10 weeks. Leachate samples were collected weekly and analyzed for pH, zinc and cadmium content. After ten weeks, plant roots, stems and leaves were harvested and soil samples collected. In pH treatments of 5.3, 4.0 and 3.0, leachate pH remained approximately 6.0, indicating the strong buffering capacity of this soil. Leachate zinc and cadmium content were similar for the three treatments. Leachate from the pH 2.0 treatment had a mean pH of 2.5 and much higher cadmium and zinc content than the other treatments. Acid rain at pH 2.0 exceeded the buffering capacity of this soil and increased the solubility of cadmium and zinc. Uptake and distribution of cadmium and zinc in plant tissues over all treatments will be discussed.

(43)

A New *Ellobiophyra* Species (Ciliophora) Symbiotic on the Ectoprost, *Bugula neritina*

JOHN C. CLAMP
North Carolina State Museum of Natural History and North Carolina State University

An undescribed peritrich ciliate clearly belonging to the genus *Ellobiophyra* was discovered on the tentacles of *Bugula neritina* zooids. The peritrich occurs abundantly at but one locality in North Carolina, is most numerous during early winter and lives only on *B. neritina*. Its orientation on the host suggests that the ciliate benefits from the feeding current of the ectoprost.

The new *Ellobiophyra* species differs from its only congener *E. donacis*, reported from a single locality in France, in several ways. It is the first representative of its genus recorded from North America. More significant is the fact that some of its structural features cast doubt upon the criteria currently used to separate genera in the family Ellobiophyridae.

(44)

Seasonal and Spatial Variation of Oligochaetes (Naididae, Tubificidae) in a Thermally Altered Estuarine Lake

DARRYL R. CLARK

University of Southwestern Louisiana

Nine naid and three tubificid oligochaete species were collected in benthic and fouling samples from March, 1977, to February, 1978, in Lake Peigneur, a shallow estuarine lake in south central Louisiana. The dominant species included the naids *Dero obtusa* d'Udekem, *Wapsa grandis* Harman, *Stephensoniana trivandana* (Aiyer), *Chaetogaster langi* Bretscher and *Bratislavia unidentata* (Harman). Tubificids encountered in the lake included *Limnodrilus maumeensis* Brinkhurst and Cook, *Tubificoides* (= *Peloscotex*) *heterochaetus* (Michaelsen) and *Aulodrilus pigueti* Kowalewski.

Limnodrilus maumeensis reached densities as high as $3.5 \times 10^4/\text{m}^2$ in the spring and early summer of 1977 but declined in numbers during the fall and winter months. This species was abundant in sand, loose clayey-mud and coarse plant detrital substrates. Reduced densities of *L. maumeensis* were observed in the immediate area of the heated discharge canal; but increased densities, over comparable "control" stations, were noted at thermal stations located 30 to 100 meters from the canal mouth. *Tubificoides heterochaetus* occurred only in shallow (0.0-0.5 m) littoral regions of Lake Peigneur where sandy and coarse plant-detrital substrates predominated. The naid, *Dero obtusa*, was the most common oligochaete that occurred on Hester-Dendy artificial fouling plates.

(45)

Field Studies on Myxomycetes from the Fernbank Science Center Forest

ELLIOTT C. COLEMAN, SR.
Atlanta UniversityLAFAYETTE FREDERICK
Howard UniversityRAY SIMONS
Fernbank Science Center

Extensive field collections of myxomycetes have been made in the forest of the Fernbank Science Center during the past three years. The Fernbank Science Center forest is a relatively undisturbed 65 acre tract in the northeast section of metropolitan Atlanta in which oak, beech and hickory represent the climax vegetation. The myxomycete bionta of the forest has been found to be rich and diverse. Twenty-six genera and seventy-three species have been identified. Fourteen of these species represent new records for the State. They are: *Badhamia populina*, *Calonema aureum*, *Diderma globosum*, *D. niveum*, *Didymium ochroideum*, *D. orthonemata*, *Leocarpus fragilis*, *Lycogala conicum*, *Physarella oblonga*, *Physarum contextum*, *P. confertum*, *P. flavicolum*, *P. psittacinum* and *P. serpulula*. Two other species, previously reported from the State but relatively uncommon in occurrence, were *Comatricha lurida* and *Perichaena microspora*. Other notable collections include undetermined species of *Craterium*, *Didymium*, *Hemi-*

trichia, *Oligonema* and *Physarum*. Of the 150 species of slime molds known from the State, more than two-thirds of these species have been collected from the Fernbank Science Center.

(46)

Bursicon Induced Cyclic AMP Levels in the Blood Cells of the American Cockroach

DAVID A. COMPTON, SHANNON C. SHAFER AND
RICHARD R. MILLS

Virginia Commonwealth University

Bursicon, the insect sclerotization hormone, induces the formation of cyclic AMP. Incubations at room temperature result in minute amounts of cAMP due to high levels of phosphodiesterase (PDE). However, depressing the incubation temperature to 4 C retards the action of PDE and allows the build-up of cAMP.

Dopamine mimics the action of the peptide hormone, bursicon. *In vivo* experiments using the potent PDE inhibitor, isobutylmethylxanthine (IBMX), were attempted in order to increase the cAMP levels. However, little increase resulted due to the apparent inability of IBMX to penetrate the intact cells. Molecular sieve chromatography on P-60 polyacrylamide separated the soluble haemocyte proteins into two major fractions. The larger proteins bound ^3H -cAMP. Inhibition of PDE shown a lower ^3H -cAMP binding suggesting that PDE makes up most of the larger proteins binding the label.

(47)

Energy Distribution in the Sexes of *Rumex hastatulus* Baldwin ex Ell.

J. S. CONN AND UDO BLUM
North Carolina State University

Energy distribution in males and females of *Rumex hastatulus* was studied over a nutrient-density gradient (4×4) in a greenhouse. Density levels ranged from 18 to 1880 individuals/ m^2 , and density levels ranged from 3 ppm N, 47 ppm P and 2 ppm K to 77 ppm N, 80 ppm P and 62 ppm K. Flowering individuals were separated into roots, rosettes, inflorescence leaves, inflorescence stems and fruits (females only). Caloric content was determined with an adiabatic bomb calorimeter. Shapes of the response surface models for each variable were not significantly different with respect to sex. However, females took longer to flower, had taller inflorescences, were heavier and allocated more energy to reproductive structures than did males.

(48)

S.E.M. and T.E.M. Observations of the Tegument and Sensory Structures of the Cercaria of *Schistosomatium douthitti* (Trematoda)

NICHOLAS CONTOS AND ROBERT B. SHORT
Florida State University

The outer body layer or tegument of the cercaria of *S. douthitti* is an anucleate syncytium communicating by means of cytoplasmic bridges to subtegumentary cells

lying below the muscular layers of the body wall. The subtegumentary cells are filled with secretory granules which appear to evolve into multilaminar bodies as they migrate through the cytoplasmic connections to the tegument. Small backward pointing spines nearly completely cover the body surface. Spineless areas are limited to the anterior tip, around the mouth, and around the base of the ventral sucker. Bulbous sensory nerve endings ("papillae") emerge through the tegument in a rather constant arrangement. There are three basic types of papillae: unilaminar bulbs, multiciliated pits and knobs without cilia. In addition, a new type of two-ciliated bulb papilla was observed at some locations; the cilia differ both in external and internal morphology from those of other papillae.

(49)

Preliminary Studies on the Role of Chaetognaths as Planktonic Predators of Marine Fish Larvae

LINDA COSTON-CLEMENTS

National Marine Fisheries Service,
Southeast Fisheries Center

Predation is one of the major factors determining the survival of young fish. Various species of chaetognaths appear to be among the more numerous predators of fish larvae in the zooplankton community in the North Carolina Continental Shelf waters during the winter months. Plankton samples from six winter cruises on the *RV John de Wolf II* in the area of Onslow Bay, North Carolina, were examined for relative abundance and distribution of fish larvae and chaetognaths. Large numbers of chaetognaths and larvae of several commercially important species of fish including spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulatus*) and Atlantic menhaden (*Brevoortia tyrannus*) were obtained from the same plankton. The ratio of head width to total length of chaetognaths may serve as a means of determining the vulnerability of fish larvae at different sizes to predation. Once this correlation is established for the major species, the information can be applied to each length distribution by station to determine the portion of the chaetognath population capable of preying on the larval fish present.

(50)

Effect of Growth Medium Modifications on Rooting of Soybean Cotyledons

BUFORD J. CREECH AND PREM P. SEHGAL

East Carolina University

Organogenesis in soybean cotyledons and callus is difficult to obtain. Causal factors regulating root and bud initiation are not well understood. In our experiments, soybean cotyledons were incubated on Thompson's growth medium with various modifications. The change in growth medium were: (1) the omission and/or addition of carbon and nitrogen sources, (2) variations in the dosage of naphthalene acetic acid and kinetin, and (3) some interactions of carbon and nitrogen sources with different levels of hormonal stimuli. Effects of different growth surfaces, light/dark conditions and pH were also studied. Rooting of cotyledons was obtained under many experimental conditions. The causal factors for

root initiation in cotyledons and callus obtained from several serial transfers will be discussed.

(51)

Lead Concentrations of Sap Extracted from Urban Plants

WENDELL P. CROPPER, JR. AND HARVEY L. RAGSDALE

Emory University

A pressure-bomb was used to extract sap from leaves of *Ailanthus*, *Mimosa*, *walnut* and *kudzu* vines. Lead concentrations, determined by flameless atomic absorption spectrophotometry, ranged from 1 to 35 parts per billion. Sap was collected as successive 300 microliter fractions from each leaf until a total volume of 2.1 ml was collected. The lead concentration of extracted sap decreased with increasing volume collected. Water potential of extracted sap was measured with a thermocouple psychrometer as a test of non-xylem solute contamination. The water potential of extracted sap ranged from -0.1 to -1.0 bars. These values were consistent with those published for pure xylem sap. Lead concentrations in extracted sap were several orders of magnitude lower than lead concentrations in the vegetation tissue.

(52)

Preliminary Niche Analysis of an Odonate Community (Insecta)

PHILIP H. CROWLEY AND DAN M. JOHNSON

University of Kentucky and
East Tennessee State University

Two years of monthly sweep-net sampling of larval odonates in five littoral habitats at Bays Mountain Lake (Sullivan County, Tennessee) permit us to estimate niche breadths and overlaps with respect to habitat and seasonality among the dominant species in the community. Using indices closely reflecting larval encounter frequencies, we identify the specialists and generalists on each axis and determine the species pairs with unexpectedly large overlaps on both axes. The high overlap pairs, such as *Ischnura posita* and *I. verticalis*, must now be analyzed on other niche axes, e.g. food. This kind of niche analysis, as applied to odonate communities, is viewed within the context of the primary equilibrium and non-equilibrium mechanisms permitting coexistence.

(53)

The Effects of Infection with *Trypanosoma cruzi* on the Cellular Response to Alloantigens

D. S. CUNNINGHAM, R. E. KUHN AND F. M. HATCHER

Wake Forest University

In unidirectional mixed lymphocyte cultures (MLC) containing spleen cells from *Trypanosoma cruzi*-infected mice (as responders, stimulators or third party regulators), alloantigen responses were less than in cultures containing normal spleen cells only. Depletion of plastic adherent cells from infected spleen cells (stimulators or regulators) reversed the inhibitory effect on normal spleen cells (responders); removal of adherent responder

cells and/or B lymphocytes did not alter the low allo-antigen response of normal spleen cells (stimulated by infected spleen cells) or infected spleen cells (stimulated by normal spleen cells). Serum from infected mice suppressed MLC containing responder spleen cells allogeneic to the serum donor (syngeneic stimulators) when added at initiation and during the first 24 hours when added to cultures containing syngeneic responders and allogeneic stimulators. It is proposed that the serum suppressor substance regulates cell-mediated immune responses directly by suppressing the response-potential of cells and indirectly by triggering the release of a factor from adherent splenic cells which induces a hyporesponsive state in T lymphocytes.

(54)

Endogenous Stages of *Eimeria tuskegensis* (Protozoa) in the Cotton Rat, *Sigmodon hispidus*

WILLIAM L. CURRENT AND JOHN V. ERNST
Auburn University and
USDA Regional Parasite Research Laboratory

Endogenous stages of *Eimeria tuskegensis* were studied in experimentally infected cotton rats. All parasites were located in epithelial cells on the sides and tips of the villi of the small intestine. First generation schizonts, $14.3 \times 13.2 \mu\text{m}$, were found 36 to 72 h post inoculation (PI). They contained 22 to 30 merozoites and a small residual body. Second generation schizonts, $28.7 \times 24.7 \mu\text{m}$, were found 60 to 96 h PI and contained 48 to 62 merozoites and a large residual body. Third generation schizonts, $11.7 \times 10.3 \mu\text{m}$, were found 84 to 120 h PI and contained 14 to 20 merozoites and no residual body. Macrogametes and microgametocytes were found 96 to 120 h PI. Two types of wall-forming bodies were present in macrogametes. Mature macrogametes measured 20 to 28 by 12 to 18 μm . The microgametocyte had a monocentric type of development and measured 25 to 30 by 12 to 20 μm when mature.

(55)

Variations of the Dorsal Scute in *Helobdella* Blanchard (Hirudinea)

MARY G. CURRY
Jefferson Parish Environmental and
Development Control Department

In the Americas, the genus *Helobdella* Blanchard is a taxonomically confusing group, whose center of distribution is South America. Some species of *Helobdella* possess a yellow to amber to brown horny scute on the dorsum in the neck region. *Helobdella stagnalis* L., which is known from all continents except Australia, was heretofore thought to be the only species in North America to possess the dorsal scute. In some South American species certain features of the scute such as color have been regarded as taxonomic characters. However, microscopic examination of several hundred specimens of *H. stagnalis* from the southern United States revealed that in some individuals the scute was either absent or varied markedly in size, shape and color. These data, therefore, suggest that scute-bearing species other than *H. stagnalis* may be represented in North America and that more investigation is necessary, particularly in the southern United States, in order to determine the true status of scutiferous helobdellids in North America.

(56)

The Lemnaceae (Duckweeds) of Alabama

L. J. DAVENPORT
University of Alabama

Historically, the duckweeds have been poorly known in Alabama. This lack of knowledge is primarily due to lack of collecting, and only recently have extensive collections been made. Nine species of duckweeds are currently recognized as occurring in Alabama — *Lemna minor*, *L. perpusilla*, *L. trinervis*, *L. valdiviana*, *Spirodela polyrrhiza*, *S. punctata*, *Wolffia columbiana*, *W. papulifera* and *Wolffiella floridana*. Key characters in the identification of these species and their distributions within the State will be discussed.

(57)

Seasonal Changes in the Proximate Constituents of the Seagrasses *Thalassia testudinum*, *Halodule wrightii* and *Syringodium filiforme*

CLINTON J. DAWES AND JOHN M. LAWRENCE
University of South Florida

Levels (percent) of soluble carbohydrate in the rhizome of *Thalassia testudinum*, *Syringodium filiforme* and *Halodule wrightii* were highest in the fall and lowest in the spring. This suggests that soluble carbohydrate is a nutrient reserve used to sustain the plants during the period of decreased productivity in the winter. Ash and dry weight levels for all three organs were generally highest in the fall. Protein levels were highest in the summer in all organs in *T. testudinum* and *S. filiforme* suggesting highest cellular activity. Caloric levels were similar for all three species with the rhizomes having the highest level; no seasonal pattern was evident. The organic biomass of *T. testudinum* is 8-12 times greater than that of the other two species in the fall and the short shoot biomass can account for half of the entire plant. The blades of *H. wrightii* and *S. filiforme* account for the largest amount of organic material in the fall.

(58)

Histocompatibility and Fetal Growth in *Peromyscus* Species Hybrids

W. D. DAWSON AND SARA REUNING
University of South Carolina

Reciprocal interspecific F_1 hybrids of deer mice (*Peromyscus maniculatus*) and oldfield mice (*P. polionotus*) differ significantly and substantially in fetal and placental, as well as adult, size and weight. Skin grafts were exchanged between and within the two *Peromyscus* species to ascertain whether any relationship exists between mean graft retention time and body size of fetuses and adults in various F_1 and backcross combinations. *P. maniculatus* skin grafted to *P. polionotus* rejected significantly earlier than the reciprocal xenograft. All interspecific graft combinations rejected significantly earlier than intraspecific grafts. These results are consistent with the

hypothesis that immune differences could produce marked size variations in reciprocal hybrids, if placental and fetal growth respond to antigenic differences.

(59)

Litter Nutrient Dynamics in the Great Dismal Swamp

FRANK P. DAY, JR.
Old Dominion University

Nutrient concentrations in decomposing leaf and wood litter were determined in four different communities in the Dismal Swamp. The communities differ primarily in species composition and frequency and duration of flooding. Nitrogen and phosphorus concentrations increased as decomposition progressed, and the higher concentrations were in litter in the more extensively flooded communities (dominated by *Acer rubrum* — *Nyssa* spp. and *Taxodium distichum*, respectively). Decomposition rates were most rapid in the extensively flooded communities. Calcium and magnesium concentrations decreased seasonally except in the mixed hardwood community (dominated by *Quercus* spp.), which exhibited little seasonal change. The highest concentrations were in the mixed hardwood litter, which had the slowest rate of decomposition. The potassium data were highly variable.

(60)

Notes on Naturally Occurring Ponds of the Cumberland Plateau of Tennessee

W. MICHAEL DENNIS AND ERIC L. MORGAN
Tennessee Valley Authority and
Tennessee Technological University

Historically, the Cumberland Plateau of Tennessee was dotted with small (2-3 ha) ponds formed in slight depressions of the sandstone cap rock. Only a relatively small percentage of these are still in a near "natural" state due to past agricultural and lumbering practices. The remaining ponds are currently under intense pressure from strip mining and general development. Nine ponds were studied during the fall of 1979. Size, depth, orientation, percent water fluctuation and substrate were determined along with standard water quality parameters. Vegetation zones were mapped and species associated with each listed.

(61)

Comparison of Canopy and Understory Species Association Patterns in Mature Piedmont Deciduous Forests

K. DEW, J. N. SKEEN AND H. L. RAGSDALE
Emory University

In an effort to describe quantitatively the degree of association between overstory and understory species

within mature deciduous forests of the Georgia Piedmont, composition and distribution patterns of all species in two such forests were determined. Understory species (seedlings, saplings and shrubs > 30 cm high and < 10 cm DBH) and overstory species (woody stems > 10 cm DBH) were sampled at an intensity of 15% employing 0.05 and 0.10 A circular plots for species of the respective strata. Relative species importance values were determined and an ordination technique was employed to group similar plots objectively. Patterns of association and their ecological implications will be discussed.

(62)

Recovery Studies of a Damaged *Elliottia racemosa* Muhl. (Ericaceae) Population in Candler County, Georgia

DONALD J. DRAPALIK AND G. EDWARD ZEAGLER
Georgia Southern College

In January, 1979, a relatively large *Elliottia* population was unknowingly damaged during the cutting and harvesting of pine timber. This population contains at least 400 plants with the largest being about 6 m tall. During the 1979 growing season recovery was remarkable in that most broken, leaning stems put forth new growth; stumps and damaged roots regenerated additional adventitious stems up to 1.86 m tall. Many undamaged and damaged plants flowered profusely, and in the population an estimated number of 222,000 typical flowers were produced and left undisturbed. As in previous growing seasons, this apparently sexually sterile population did not produce a single fruit with normal seeds. Some damaged and undamaged plants produced both typical and atypical flowers after the normal June to July flowering period. Ms. Alice Jo Giddens, the landowner of this population site, has agreed on land management conducive to the well-being of *Elliottia* and other endangered species growing on this tract.

(63)

Systematics and Zoogeography of *Menidia conchorum* and *Menidia colei* (Pisces)

CHARLES DUGGINS, JR., A. KARLIN AND K. RELYEA
Florida State University, Tall Timbers Research Station
and Jacksonville University

Standard morphometric and meristic techniques and an electrophoretic analysis of 27 enzyme loci were applied to populations of *Menidia menidia*, *M. peninsulae*, *M. beryllina*, *M. conchorum* and *M. colei* from north-east Florida to Yucatan. No significant electrophoretic or meristic differences were found between *M. conchorum* and *M. peninsulae*, and its concluded that these forms are conspecific. *Menidia colei* is most clearly related to western Gulf of Mexico populations of *M. peninsulae*. Our data show no evidence of dispersal between the Yucatan and Florida peninsulas.

(64)

The Distribution of *Neanthes succinea*
(Frey and Leukart 1847) in the
Shallow-Water Marshes of Louisiana
(Annelida: Polychaeta)

KAREN T. DUPONT

University of Southwestern Louisiana

Neanthes succinea was collected at approximately 20 stations in 13 parishes along the Louisiana coast. Relative abundance, water temperature, salinity and soil size classification were determined at each station. Abundance and distribution of *N. succinea* along the Louisiana coast are correlated with the various environmental parameters.

(65)

Effects of Impoundment, Channelization and
Hatchery Use on Fish Composition and
Distribution in Puskus Creek, Holly Springs
National Forest, Mississippi

DANNY J. EBERT AND LUTHER A. KNIGHT, JR.

U.S. Forest Service and University of Mississippi

A survey of fishes of Puskus Creek was conducted as a part of a study on stream management in the Holly Springs National Forest of northern Mississippi. Puskus Creek, a tributary of the Little Tallahatchie River, is a shallow, relatively clear creek of moderate flow whose temperatures vary from 4 to 27 C. The creek system consists of four habitats: a spring fed headwater area adjacent to a minnow hatchery, a flood plain marsh, a 39 ha flood retarding lake and a channelized creek. Thirty-seven species or fish were found with distribution and species composition dependent upon habitat type. Dominant species numerically by habitat were: headwaters — *Lepomis cyanellus*, *Noturus nocturnus* and *Lepomis macrochirus*; flood plain-marsh — *L. macrochirus*, *Lepomis microlophus* and *N. nocturnus*; lake — *L. macrochirus*, *L. microlophus* and *Micropterus salmoides*; channelized creek — *L. macrochirus*, *Notropis camurus* and *Notropis venustus*. Twenty percent of the specimens from the headwaters area were *N. nocturnus*.

Stream deflectors, bank stabilization, artificial reefs, fertilization and vegetation control have been used by the U.S. Forest Service to protect and improve the existing habitats of the stream system. Fish populations in the system reflect these practices.

(66)

Undergrowth Community Structure of an
Ozark Hill-Southeastern Floodplain Interface

L. F. ELLIOTT

Southern Illinois University, Carbondale

The study presents gradient model for the herbaceous stratum of a 40 ha area in the Mingo Wilderness near Puxico, Missouri. Cover estimates were made for herbaceous and low woody species in July, 1979. The herb stratum on floodplain sites was dominated by several species of *Carex* with an overstory of *Quercus*

palustris and *Q. phellos*. Upland sites contained such dominant species as *Parthenocissus quinquefolia*, *Asarum canadense*, *Sanicula canadensis*, *Oxalis stricta* and *Pilea pumila*. *Rhus aromatica*, *Monarda bradburiana* and *Helianthus divaricatus* predominate in the ridgetop forest where an overstory of *Quercus velutina* and *Carya texana* occurs. DECORANA ordination indicated that herb species are distributed in response to moisture. The herb strata of this area differs from that of other floodplain-upland contacts at the northern extent of the Southeastern Floodplain Forest Region.

(67)

The Comparison of Two Methods for the
Enumeration of Bacteria in Barren River

L. P. ELLIOTT

Western Kentucky University

Relatively few studies have been made on the comparison of cultural methods for the enumeration of microorganisms in river habitats. Proper culturing of river water should include isolation, identification and accurate estimation of the number of bacteria per ml of specimen.

In this study, calibrated loops which delivered 0.01 and 0.001 ml from a sample were compared with the spread plate count method in the enumeration of bacteria from river water. Five stations along the Barren River in Warren County, Kentucky, were sampled twice monthly between March, 1978, and February, 1979. All data were analyzed using a DEC-10 computer. A Statistical Teaching Package Program (STP-V4) was used in the analysis. The results of a correlated T test showed that the two methods compared favorably ($p > 0.05$). From these results it may be concluded that use of the calibrated loops permits a simple quantitative analysis of river water. Supported by a Faculty Research Grant, Western Kentucky University.

(68)

Factors Regulating the Distribution of *Diaptomus*
(Copepoda) in Central Florida

JAMES L. ELMORE

University of South Florida

In central Florida, *Diaptomus dorsalis* is found in some lakes (D-lakes), whereas *D. floridanus* and *D. mississippiensis* co-occur in other lakes (F-M lakes). The three species were reared in 64 μ filtrates of water from the two types of lakes. Development time, clutch size, survivorship and body size were recorded from three experiments in fall, spring and summer. All three species exhibited close to optimal responses in the D-lake filtrate in all three experiments; however, the responses of *D. dorsalis* were greater than the other two species. Apparently these two species are excluded from the D-lake because they cannot reproduce rapidly enough to keep ahead of the strong predation in this type of lake. The results from the F-M filtrate suggest that all three species were stressed by low food conditions with *D. dorsalis* suffering the most, especially in the fall and summer experiments. Competition with *D. floridanus*, which is in the same subgenus, is a strong possibility for the exclusion of *D. dorsalis* from F-M lakes.

(69)

Taxonomic Study of Four Populations of
Etheostoma caeruleum (Percidae) from the
Central Appalachians

EDWARD F. ESMOND AND J. R. STAUFFER, JR.
Appalachian Environmental Laboratory

The taxonomic status of populations of *Etheostoma caeruleum* (rainbow darter) from the New, Kanawha, Monongahela and Potomac Rivers were examined using multiple discriminate analysis. Twenty-five meristic and morphometric characters were examined and induced in the analysis. The emphasis established the most important characters which separate the populations. The populations are all considered to be native with the Potomac, New and Monongahela River populations isolated by geographic barriers.

(70)

Species Delimitation in the Genus *Isoëtes*

A. MURRAY EVANS AND BRIAN BOOM
University of Tennessee

Data are accumulating concerning species limits in the taxonomically confusing genus *Isoëtes*. Many taxa have limited ecological and geographic tolerances. The vegetative habit is very plastic, and the morphology of the megaspore has traditionally been the most reliable character. SEM studies confirm and enhance this with the caveat that age and maturity of the megaspore is an important variable. Artificial interspecific and intersectional hybridization has been established, and we now recognize the existence of several natural hybrid populations. This includes one taxon generally recognized at the species level which has been reinterpreted. Cytological data, including meiotic pairing behavior, is still poorly known. These current investigations into *Isoëtes* both further our understanding of the genus and also bring into question our current taxonomic treatments of the taxa therein.

(71)

The Vascular Flora of Draper's Bluff,
Union-Johnson Counties, Illinois

MARC EVANS AND SHERRI WADHAM
Southern Illinois University, Carbondale

A floristic study of Draper's Bluff in extreme southern Illinois is presented with descriptions of 4 broad community associations. A brief description of climate, topography, geology and soils is also included.

(72)

Fishes of the North Fork Holston River

JOE C. FEEMAN, JR.
Tennessee Valley Authority

Recent surveys by the Tennessee Valley Authority (81 collections from 1971-1977), along with extensive

historical collections, have proven the North Fork Holston River drainage to have a unique and diverse fish fauna. Located in the Appalachian physiographic region in southwest Virginia and northeast Tennessee, the North Fork watershed drains 188,810 ha. Annotated accounts of 72 species representing 12 families are presented with comments on distribution, habitat preference and protective status. A discussion of past disturbances and their effects on the composition of fish species and possible occurrences of stream capture are also presented.

(73)

Photo-Thermoperiodic Effects on Fat Stores and
Testicular Growth in the Green Anole,
Anolis carolinensis

BLAINE R. FERRELL
Western Kentucky University

ALBERT H. MEIER
Louisiana State University

Two circadian oscillations are involved in regulating fat stores in the Green Anole, *Anolis carolinensis*. One oscillation is entrained by the photoperiod and the other by the thermoperiod. Changing interactions between these oscillations may represent a mechanism whereby seasonal conditions of fat stores are regulated. Fat stores in anoles increased or decreased in response to a 6-hour period at 30 ± 2 C (thermoperiod). The response depended on the timing of this thermoperiod treatment relative to the photoperiod of a LD 12:60 cycle. Anoles were kept at 20 ± 2 C the remaining hours of each light-dark cycle. Furthermore, the response of fat stores to a single thermoperiod during each LD 12:60 cycle was similar in groups receiving treatment at 24-hour intervals. Testicular growth may be regulated similarly. However, this possibility needs to be explored further.

(74)

A New Basic Chromosome Number in *Amaryllis*
(Amaryllidaceae) of Suggestive Evolutionary
Importance

WALTER S. FLORY
Wake Forest University

Of the approximately 100 species of *Amaryllis*, chromosome numbers and karyotypes have been determined for about 25. All authenticated reports show a base number of $n = 11$, with most species being $2n = 22$, but a few with somatic numbers of 33, 44, 66 or 77. Most diploid karyotypes reported include: 8 short-medial; 8 long-subterminal; and 6 rather intermediate-lengthed-subterminal chromosomes. *Amaryllis moreliana* (Lem.) Traub, from Brazil, has now been determined to have 24 somatic chromosomes. The karyotype is similar to that known for most other species, except that there are 10 short-medial chromosomes present here. Since the two most prevalent basic numbers for Amaryllidaceae are $n = 6$ and $n = 11$, the possibility exists that *A. moreliana*, with $n = 12$ chromosomes, represents an important evolutionary link within this family.

(75)

Intestinal Flagellates of the Anura of South Carolina

J. CHARLES FLOYD AND FELIX H. LAUTER
University of South Carolina

Fourteen species of intestinal flagellates parasitizing the Anura of South Carolina have been identified and described. The flagellates were impregnated with silver-protein for identification and morphological study. The following flagellates were identified: *Chilomastix caulleryi* (Alexeieff) 1909, *Hexamastix batrachorum* (Alexeieff) 1911, *Hexamitus intestinalis* Dujardin (1841), *Karotomorphia swezyi* (Grasse) 1926, *Monocercomonas batrachorum* (Dobell) 1909, *Monocercomonoides melolonthae* (Grasse) 1879, *Octomastix batrachorum* (Swezy) 1915, *Octomitus neglecta* (Lavier) 1936, *Retortamonas dobelli* (Bishop) 1931, *Trepomonas agilis* Dujardin 1841, *Trimitus parvus* (Grasse 1932, *Trichomonas augusta* (Alexeieff) 1911, *T. batrachorum* (Perty) 1852 and *Urophagus intestinalis* (Alexeieff) 1910. In addition, the ciliates *Opalina* sp., *Nyctotherus* sp. and *Zelleriella* sp. were identified.

(76)

Potential Natural National Landmarks in East Central Lowlands

JAMES S. FRALISH, GEORGE T. WEAVER AND
STANLEY E. HARRIS
Southern Illinois University, Carbondale

The Central Lowlands Physiographic Province as designated by Fenneman (1938) includes the glaciated region of central and northcentral United States. Under a grant from the Heritage Conservation and Recreation Service (USD1), the Central Lowlands Province east of the Mississippi River (ECL) is being examined for potential ecological and geological national landmarks. A prerequisite to an adequate system of national landmarks is the division of the ECL or other physiographic province into natural divisions similar to those developed for Illinois by Schwegman (1973). Natural divisions within the Province are based on bedrock geology, soil, topography, drainage and the type and distribution of plant communities. A tentative system of natural divisions for the ECL will be examined.

(77)

Synergistic Behavior of Heavy Metal Combinations Detected by the Fern and Moss Spore Germination Bioassay

PATRICK C. FRANCIS AND RAYMOND L. PETERSEN
Howard University

Spores of both a fern, *Osmunda cinnamomea*, and a moss, *Polytrichum commune*, were employed in a heavy metal toxicity bioassay procedure based on percent spore germination. The divalent ions of Cd, Cu and Zn were assayed separately and in all equal weight combinations (Cu:Cd, Cu:Zn, Cd:Zn and Cu:Cd:Zn). In both plant systems: 1) Cu was more toxic than Cd which was more toxic than Zn and 2) all metallic ion combinations

showed greater than expected (synergistic) toxicities then if their effects were additive.

(78)

Vaucheria (Xanthophyta, Vaucheriaceae) of the Central Florida Gulf Coast

SUSAN B. GALLAGER AND HAROLD J. HUMM
University of South Florida

Three species of *Vaucheria*, *V. velutina*, *V. longicaulis* and *V. litorea*, have been found in the greater Tampa Bay area of the Florida west coast. They colonize a band of the intertidal zone principally between mean low water and extreme low water along low energy beaches between mangrove stands or salt marshes and the innermost edge of beds of the seagrass, *Halodule wrightii*. Each species appears about November 1, forming dense mats that stabilize and promote further accumulation of fine sediments, and disappear between April 15 and May 15. Culture experiments indicate that exposure to a temperature of 23 C or below stimulates their appearance in the fall. It is believed that the genus, when apparently absent from May to October, is present in the form of dormant zygotes that were produced late in the previous growing season. Sediments stabilized and accumulated by *Vaucheria* during the cooler months are more or less maintained by mat-forming bluegreen algae during the warmer months.

(79)

Small Photosynthetic Flagellates in Tampa Bay (Florida) and an Adjoining Mangrove Embayment

WILLIAM E. GARDINER AND CLINTON J. DAWES
University of South Florida

An ongoing floristic survey of the small photosynthetic flagellates found in Tampa Bay and an adjoining mangrove embayment has revealed about 65 species in 30 genera. In taxonomic investigations of such organisms, ultrastructural evidence is often required to corroborate features observable with the light microscope. Hence, clonal cultures are being established to allow examination by electron microscopy. A technique whereby living individuals are observed with light microscopy at powers as high as 400 X, without a coverslip, is being used to identify individuals and to estimate the order of magnitude of their abundance in whole-water samples. A few species, especially one tentatively identified as *Amphidinium klebsii* Kofoid & Swezy (Dinophyceae), have been found concentrated at the sediment-water interface in the shallows of the mangrove embayment. We have not detected *Amphidinium klebsii* in Tampa Bay plankton samples. It may have special requirements satisfied in shallow benthic habitats.

(80)

Longevity in the Aquatic Turtle,
Pseudemys scripta (Emydidae:Chelonia)

J. WHITFIELD GIBBONS, RAYMOND D. SEMLITSCH AND
JUDITH L. GREENE

Savannah River Ecology Laboratory

Turtles are emerging as an important experimental group in testing life history theory because of the feature that individuals are long-lived compared to most other types of animals. A direct quantitative determination of longevity has not been previously presented for any turtle species but can be made from data available from our study populations. Twelve years of mark-release-recapture information on individuals (original captures = 2318; recaptures = 1727) in several populations of *Pseudemys scripta* in South Carolina permit this assessment of adult survivorship and longevity in this species.

(81)

Color Variation in Epinepheline Groupers

R. GRANT GILMORE AND ROBERT S. JONES

Harbor Branch Foundation, Inc.

Submersible observations made of various grouper species on the east Florida continental shelf have revealed multiple color patterns for *Mycteroperca microlepis*, the *Mycteroperca interstitialis-phenax* complex and the *Epinephelus niveatus-nigritus-flavolimbatus* complex. The ability of one individual to change from one color pattern to another can lead to confusion in identification. *In situ* observations of *Epinephelus* spp. and *Mycteroperca* spp. demonstrate that they can change their coloration to patterns currently considered distinct for two separate species. These color patterns are apparently associated with a complicated behavior and social organization, age, sex and other attributes.

(82)

Photorespiration in the Red Algae

A. E. GLUCK AND C. J. DAWES

University of South Florida

Photocrespiration is the light induced production of glycolate and release of carbon dioxide. Plants with the process exhibit an increase in oxygen production in the presence of the inhibitors glycidate and hydroxypyridinemethane sulfonic acid and increase in the concentration of oxygen in the atmosphere. While the red alga, *Hypnea musciformis*, exhibits an increase in oxygen production with an increase in oxygen in the atmosphere and in the presence of hydroxypyridinemethane sulfonic acid and glycidate, the red alga, *Gracilaria verrucosa*, does not. Hence, the results indicate that two algae of the red algal order Gigartinales differ with regard to the presence of photorespiration.

(83)

Genetic Control of Pollen Exine Morphology in
Hibiscus sect. *Furcaria* (Malvaceae)

S. G. GOETZ

Florida State University

It has usually been assumed that the diploid sporophytic genome rather than the haploid gametophytic genome controls exine morphology in pollen. Pollen from several different interspecific F₁ hybrids was studied. Segregation of morphological features was observed in several hybrids, indicating that the haploid spore genome does contribute information for exine patterning. Also, in the one set of reciprocal hybrids available, differences appeared which suggest that maternally-inherited factors may also be involved in the control of exine morphology. Supported in part by U.S.D.A. Cooperative Agreement No. 12-14-7001-1046.

(84)

Litterfall Rates in Four Communities in the
Great Dismal Swamp

MARTA GOMEZ AND FRANK P. DAY, JR.

Old Dominion University

Four sites in the Great Dismal Swamp which differed in dominant vegetation and extent of flooding were studied. The communities, indicated by dominant species, in order of decreasing total litterfall were cypress (*Taxodium distichum*) > white cedar (*Chamaecyparis thyoides*) > maple-gum (*Acer rubrum-Nyssa* spp.) > mixed hardwood (*Quercus* spp.). The highest leaf fall rate was in the maple-gum community, followed by the cypress, cedar and mixed-hardwood communities. The two communities which had the greatest amount of leaf fall were characterized by a greater degree of flooding. The deposition of leaf litter showed marked seasonal trends; woody litterfall was continuous throughout the year and showed high variability. The ranked order of communities based on amount of wood litterfall was cedar > cypress > mixed hardwood > maple-gum. The deposition of large branches and boles in three of the study sites was also determined.

(85)

Analysis of a Big River Mussel Bed

CHARLES H. GOOCH AND BILLY G. ISOM

Tennessee Valley Authority

A previously unknown mussel bed was discovered while investigating the mussel fauna below Cordell Hull Dam on the Cumberland River. A detailed examination of the bed was undertaken to determine the population composition and the extent of the bed. Methods used for gathering qualitative data were random scuba sampling and commercial brail techniques. A system of grid sampling along transects was used to determine density, composition and physical boundaries of the bed. Twenty-two species of mussels were recorded from this bed. The population at the time of sampling was estimated at approximately 100,000 mussels.

(86)

Characterization of Transfer Ribonucleic Acid (tRNA) Mutants of *Escherichia coli* by Use of Pyrolysis-Gas Chromatography/Mass Spectrometry Analysis

PAUL GOODLEY AND ARTHUR L. WILLIAMS
University of Kentucky

In *Escherichia coli* and *Salmonella typhimurium*, tRNA molecules have been implicated to play a key role in the regulation (control) of biosynthetic operons. In this study, the modern technique involving pyrolysis-gas chromatography/mass spectrometry analysis was used in an effort to detect and characterize structural alteration(s) in tRNA molecules of the mutant strains. tRNA preparations were isolated from mutant and wild type strains by a standard extraction procedure and subjected to pyrolysis gas chromatography and mass spectrometry for characterization. The raw data were transmitted to a computer for direct analysis and comparison. A summation of our data reflected distinct molecular alterations found in mutant tRNAs as compared to the wild type. Moreover, these alterations will be correlated with respect to regulatory mechanisms.

(87)

Status and Decline of the Canada Goose (*Branta canadensis*) in Florida

THOMAS M. GOODWIN
Florida Game and Fresh Water Commission

An estimated 30,000 to 40,000 Canada geese wintered in the vicinity of the St. Marks National Wildlife Refuge and Apalachicola Bay in northern Florida until about 1935. In 1941 there began an abrupt change in the wintering habits of geese utilizing this coastal area. Short-stopping of birds on areas further north, along with changes in agricultural harvest methods, resulted in fewer geese in Florida each year. This report addresses the reasons for the decline of Canada geese in Florida as well as the efforts made to increase them in the State. Migration routes were analyzed, northern nesting areas defined and the source of the Florida flock was ultimately pinpointed by band returns from birds either banded or collected in Florida over the past twenty years.

(88)

Nutrient Losses from Perturbed Forest Soils

MARLIN R. GOTTSCHALK
Emory University

Intact soil cores excised from the floor of an oak-hickory forest in Georgia were maintained in environmental chambers for 40 weeks to determine nutrient losses following perturbation. Nutrient export from these terrestrial microcosms, as measured by weekly sampling of soil leachates, increased significantly over time until stabilization occurred at about week 32. Calcium, magnesium and potassium concentrations in these

soil leachates increased from 1.5, 2.0 and 4.0 $\mu\text{g/ml}$ (ppm) to 53.1, 33.5 and 26.0 ppm, respectively. $\text{NO}_3\text{-N}$ concentrations increased from 0.3 ppm to 110.7 ppm. $\text{NH}_4\text{-N}$ concentrations peaked at 5.0 ppm. $\text{PO}_4\text{-P}$ concentrations remained relatively constant at 20-40 ng/ml (ppb). These results demonstrate the low resistance of these relatively fertile soils to nutrient losses following disturbance. This corroborates previous studies of the processes that could delay or prevent solution losses of nutrients from perturbed forest soils.

(89)

Subfossil Mosses from the Páramos of Colombia

DANA GRIFFIN, III
University of Florida

ANTOINE M. CLEEF
Rijksuniversiteit, Utrecht

The aquatic moss flora of the Colombian páramos includes species of *Sphagnum*, *Fissidens*, *Dutricium*, *Fontinalis*, *Calliergon*, *Cratoneuron*, *Drepanocladus*, *Hygrohypnum* and *Scorpidium*. Recent corings in paramo lake sediments have revealed that stem fragments, whole leaves and leaf parts representing several of these taxa are recoverable from depths exceeding 100 cm. Bryophytes separated from the cores show little or no mineralization and are termed subfossils. *Dutricium submersum* is particularly well preserved because of its strong and apparently decay-resistant costa. Study of these subfossils aids in establishing various climatic chronologies and in clarifying the age and history of aquatic ecosystems in the Northern Andes.

(90)

The Fishes of Bayou Sara, a Lower Mississippi River Tributary, with an Analysis of Environmental Factors Influencing Species Distributions

JAMES M. GRADY
Southern Illinois University, Carbondale

ROBERT C. CASHNER
University of New Orleans

A survey of the fishes of Bayou Sara in southwestern Mississippi and eastern Louisiana was conducted between June, 1976, and May, 1979. Fifty-two species representing 13 families were recorded from Bayou Sara with two cyprinid species, *Notropis chrysocephalus* and *N. venustus*, accounting for 87% of the total specimens captured. Data obtained from fish collections and measurements of 17 environmental parameters made at six stations along Bayou Sara were subjected to a multiple discriminant functions analysis to identify significant environmental variables accounting for the separation of fish distributions. A single significant discriminant function accounting for 78% of the variance among fish distributions was extracted. Stream position provided the most significant contribution to this function.

(91)

Phytoplankton Dynamics in Two Southern Illinois Swamp Regions

MARCIA M. GRADY

Southern Illinois University, Carbondale

Investigations of the phytoplankton of Winters Pond, LaRue Swamp (Union County) and Horseshoe Lake (Alexander County) were conducted over 12- and 20-month periods, respectively. Various physical-chemical parameters were studied in relation to phytoplankton density, periodicity and diversity. Results indicate wide dissimilarities between the two swamps. Phytoplankton density in Winters Pond ranged from 400 pl/ml to 4500 pl/ml. pH ranges were narrowly circumneutral (6.2-7.3). Nutrient levels were low but constant. Periodicity was observed to be closely related to seasonal light and temperature changes. Dominant phytoplankters were members of the Chlorococcales, Cryptophyceae and Chrysophyceae. Species diversity showed a wide range with a mean of 7.19 (richness).

Horseshoe Lake appears to be a highly productive lake with phytoplankton density ranging from 12 000 pl/ml to 30,000 pl/ml. pH values ranged widely (5.8-9.6). Nutrient levels were higher with greater variability. Periodicity was observed to be closely related to nutrient levels and pH. Dominant phytoplankters were members of the Cyanophyta and Bacillariophyceae. Species diversity showed a much narrower range with a mean of 8.71 (richness).

(92)

Survival of Sheepshead Minnow (*Cyprinodon variegatus*) Embryos, Fry, Juveniles and Adults Exposed to Treated Bleached Kraft Mill Effluent at Various Dissolved Oxygen Levels

W. C. GRAVES, D. T. BURTON, L. B. RICHARDSON AND S. L. MARGREY

Benedict Estuarine Research Laboratory

The interaction of dissolved oxygen (DO) concentration and treated bleached kraft mill effluent (BKME) on the survival of embryo, fry, juvenile and adult developmental stages of the sheepshead minnow (*Cyprinodon variegatus*) was investigated by using a 3×3 complete matrix design with two replicates per cell. Each life stage was exposed under continuous-flow conditions to effluent concentrations of 0, 50% and 100% ($v v^{-1}$) and nominal DO concentrations of 1.0, 3.0 and 5.0 $mg\ l^{-1}$. Mortality observations at the end of 96 h were used for statistical analyses.

The percent of embryo hatching success was solely related to effluent concentration. Survival of the fry was related only to DO concentration. Juvenile fish showed increased sensitivity to BKME at a nominal DO concentration of 1.0 $mg\ l^{-1}$. Adult fish were not affected by BKME at any of the DO concentrations tested. This study shows that a systematic investigation must be made on each life stage of a test organism in order to fully evaluate any potential interactions of treated BKME and low DO concentrations. Supported by Scott Paper Company.

(93)

Geographical Variation and Climatology of the Temperate Broadleaved Evergreen Forest Region in Florida

ANDREW M. GRELLER

Queens College, C.U.N.Y.

Mesic sites in Florida, exclusive of the Northern Highlands section and the southern tip-southeastern coast, are characterized by broadleaved forests dominated by *Quercus virginiana* and *Sabal palmetto*, usually with other broadleaved evergreens. This area is referred to as the Temperate Broadleaved Evergreen Forest region (TBEF), after E. Lucy Braun. The TBEF shows a broad transition to the mainly deciduous Southern Mixed Hardwood Forest to the north and a narrower transition to forests dominated by tropical taxa to the south. Statistics of the duration and severity of the winter cold period, especially frost frequency, appear to coincide with boundaries of the TBEF; causal relationships can be inferred from these data. The macroclimate of the TBEF region may be characterized, using Bailey's system, as: Warm-Very Warm, Subtemperate-Temperate, Moist Subhumid-Humid (= "Moist Subtropical" of Holdridge). I discuss variations of arboreal floristic composition in relationship to the geography of the TBEF.

(94)

Population Variation in Sexual Dimorphism of *Pseudemys scripta* (Emydidae:Chelonia)

JUDITH L. GREENE AND J. WHITFIELD GIBBONS

Savannah River Ecology Laboratory

Many species of animals exhibit sexual dimorphism in body size. In the yellow-bellied turtle, *Pseudemys scripta*, females characteristically reach significantly larger body sizes than males. Several populations of *P. scripta* in South Carolina differ significantly from one another in individual growth rates of juveniles and in the resultant size of adults within each population. This permits a comparative examination of the size structure among populations. Possible explanations for the pattern of sexual dimorphism observed among populations and the differential responses of the sexes to body size attainment will be discussed.

(95)

Karyotype Evolution and Sex Chromosome Differentiation in Digenetic Trematodes

ABRAHAM I. GROSSMAN AND ROBERT B. SHORT

Florida State University

On the basis of chromosome morphology and numbers of a series of digenetic trematodes a possible pathway of karyotype evolution in this group is proposed. It is hypothesized that the karyotype of primitive trematodes contained 10 or 11 pairs of acrocentric chromosomes, and reduction of chromosome numbers resulted from centromere fusion, rather than elimination of chromosomes.

From observations of heteromorphic pairs of chromosomes in certain hermaphroditic trematodes and the

comparison of heterochromatin constitution of sex chromosomes in the dioecious schistosomes, the following steps in the evolution of sex chromosome differentiation is proposed: 1) In hermaphroditic trematodes "predifferentiation" of potential sex chromosomes occurred and 2) Gross differences between sex chromosomes in the schistosomes resulted from (a) chromosome fusion, (b) partial heterochromatinization of one sex chromosome homologue and (c) subsequent elimination of the differential heterochromatic region.

(96)

The Effect of Hurricane Bob on the St. Louis Bay Tidal Marshes: Transport and Relocation of Debris

COURTNEY T. HACKNEY AND T. DALE BISHOP
University of Southwestern Louisiana

The effect of a low level hurricane (Bob) on the transport and relocation of marsh debris (dead plant material) was evaluated. Aerial photographs and ground truth data indicated that debris (wrack) was distributed on the marsh along areas of higher vegetation. The mean density of the resultant wrack was 2.19 kg/m^2 . Approximately $226 \times 10^3 \text{ kg}$ of unattached dead plant material was removed from the marsh and $7.7 \times 10^3 \text{ kg}$ redeposited as wrack. Thus, $218 \times 10^3 \text{ kg}$ of dead plant material was removed from the 96 ha study area and transported from the marsh system.

(97)

The Response of *Amaranthus retroflexus* L. (Amaranthaceae) Seed Germination and Seedling Growth to Soil Containing Different Types of *Helianthus annuus* L. (Asteraceae) Debris

ANTHONY B. HALL AND UDO BLUM
North Carolina State University

Helianthus annuus L. var. "Russian Mammoth" plants which had been grown under different nutrient regimes in either the greenhouse or field were harvested, freeze-dried and coarsely ground in a blender. There were seven distinct debris types; two levels (2, 5 grams/pot) of each debris type were added to pots containing *Amaranthus retroflexus* L. seeds under greenhouse conditions. *Amaranthus* seed germination in the pots containing *Helianthus* debris was significantly inhibited compared to germination in the control pots which contained no debris. Seed germination was significantly correlated with total phenol (expressed as mg chlorogenic acid equivalents) added to the soil by the *Helianthus* debris and was not significantly correlated with any other variable determined. *Amaranthus* seedling dry weights determined after four weeks were also inhibited by *Helianthus* debris in the soil compared to control plants. *Amaranthus* dry weight was correlated with total phenol, nitrogen, phosphorus and potassium added to the soil by *Helianthus* debris. Regression models for *Amaranthus* seed germination and seedling growth will be discussed as well as the effects of the addition of a nutrient solution to the debris types on *Amaranthus* germination and growth.

(98)

Trichinella spiralis: Osteolysis in Infected Rats

JOHN P. HARLEY AND BARRY S. ROSS
Eastern Kentucky University

Based upon the present inability to describe the mechanism by which calcification takes place and the unexplored metabolism of calcium during trichinosis, studies of rat bone involvement were undertaken. Significant ($P < 0.05$) differences were found in experimental (*Trichinella spiralis* infected) rat femurs versus those of noninfected rats. Analysis by atomic absorption spectroscopy, dry femur weight and tensile resistance indicated an overall reduction in calcium content. This reduction is due to active cyst calcification. Results confirming this finding revealed significant ($P < 0.05$) differences at days 60-80 PI (the beginning of cyst calcification).

(99)

An Investigation of the Ridge-top Vascular Flora of North Fork Mountain, Eastern Panhandle, West Virginia

PAUL J. HARMON
Southern Illinois University, Carbondale

North Fork Mountain lies within the Valley and Ridge Province of the Eastern Panhandle of West Virginia. A product of the Willis Mountain Anticline, it is one of the most rugged, harsh and cool habitats within the State. A preliminary report of the vascular plants found during the first summer of a two year study of the Tuscarora quartzite cliffs, heath barrens and ridge forests of the entire ridge reveals a number of interesting Allegheny extension species as well as vascular plants which are rare in West Virginia.

(100)

The Effects of a Sublethal Dose of Copper Sulfate on the Colonization Rate of Freshwater Protozoan Communities

KATHERINE M. HART, JOHN CAIRNS, JR. AND
MICHAEL S. HENEБРY
Virginia Polytechnic Institute and State University

Freshwater protozoan communities established on polyurethane foam artificial substrates served as epicenters (source pools) for the colonization of artificial substrate islands under laboratory conditions. Control and toxicant systems (0.42 ppm CuSO_4) were monitored using epicenters of different stages in community development. The number of colonized species was determined on Days 1, 3, 5 and 7. Differences in the rate of colonization were analyzed under the Poisson distribution. The presence of a sublethal concentration of copper sulfate decreased the rate ($\alpha = 0.05$) in both mature (stable number of species) and immature epicenter systems; however, the effects on the immature systems were significantly greater ($\alpha = 0.05$). Thus, a correla-

tion exists between the length of initial colonization of the epicenter in the lake and the ability of the community to colonize uninhabited islands in the laboratory when under a heavy metal stress.

(101)

Aldehyde Oxidase and Aldehyde Reductase in Normal Rat Liver and Chemically-Induced Rat Hepatomas

WILLIAM K. HARVEY AND RONALD LINDAHL
University of Alabama

Three enzyme systems, aldehyde dehydrogenase (aldehyde: NAD(P) oxidoreductase E. C. 1.2.1.3 and E. C. 1.2.1.5), aldehyde oxidase (aldehyde: oxygen oxidoreductase E. C. 1.2.3.1) and aldehyde reductase (alcohol: NADP oxidoreductase E. C. 1.1.1.2) are directly involved in aldehyde metabolism in rat liver. In chemically-induced rat hepatomas, aldehyde dehydrogenase activity is quantitatively and qualitatively different from the aldehyde dehydrogenase activity in normal rat liver. Examination of the activities of other aldehyde metabolizing enzymes may provide clues to some of the metabolic rearrangements generated in rat hepatocytes by carcinogens. We have investigated the activity of aldehyde oxidase and aldehyde reductase in rat hepatomas induced by 2-acetylaminofluorene and in normal rat liver in an attempt to study changes in aldehyde metabolism during hepatocarcinogenesis. In the hepatomas examined to date, aldehyde oxidase activity is consistently higher than the activity of this enzyme in normal rat liver. Conversely, aldehyde reductase activity is consistently lower in hepatomas than in normal rat liver. These observations are consistent with the hypothesis that an overall modification of aldehyde metabolism occurs during 2-acetylaminofluorene-induced hepatocarcinogenesis.

(102)

Reproduction and Population Structure of an Undescribed Species of *Notropis* (Pisces) from the Mobile Bay Drainage, Alabama

DAVID C. HEINS
Millsaps College

GERALD E. GUNNING
Tulane University

JAMES D. WILLIAMS
U.S. Fish and Wildlife Service

Although undescribed, *Notropis* sp. (cf. *N. longirostris*) has been recognized as a distant species for some time. It largely occurs in small to moderate size streams throughout the Mobile Bay Drainage below the Fall Line. In Uphabee Creek, Macon County, Alabama, the reproductive season extended in 1974 from early to mid-April into late September or early October. Counts of mature ova were correlated with female size and ranged from 99 to 323 for females 31-41 mm SL. Unovulated mature ova were 0.70-0.90 mm in diameter. Males matured at a slightly smaller size than females; all females were mature by 31 mm SL. The sex ratio did not differ from 1:1. This species of *Notropis* lives about 1½ to 2 years. Maturity occurs at about one year. Maximum size was approximately 45 mm SL.

(103)

A Preliminary Update of the Status of Endangered Fishes in Georgia

GENE S. HELFMAN, BYRON J. FREEMAN AND
JOSHUA LAERM
University of Georgia

The University of Georgia Museum of Natural History is presently updating the status of 40 fish species that have previously been identified as undergoing population decline and proposed for consideration for protection under Georgia's Endangered Species Act. Our initial attempt at revising this list has involved field studies, literature review, consultation with authorities and perusal of museum records. On the basis of our investigation, we have provisionally recommended that thirteen species be deleted from future consideration, one be added, and that three be considered Endangered, seven Threatened, six of Special Concern nationally, five of Special Concern statewide, while seven species have probably been Extirpated from the state. These provisional suggestions will hopefully elicit comment from researchers familiar with the species. Our final recommendations will be made as a result of such feedback combined with information on the current status of the species as determined by ongoing field surveys.

(104)

The Fishes of the Youghiogheny River

MICHAEL L. HENDRICKS, CHARLES H. HOCUTT AND
JAY R. STAUFFER, JR.
Appalachian Environmental Laboratory

Youghiogheny River is the largest tributary to the Monongahela River with a drainage basin of 4585 km². A total of 266 fish collections was made at 177 stations in the Youghiogheny River drainage yielding 56 species of fishes. Collections were made using seines, electrofishing gear, gill net and trap net.

A comprehensive literature review yielded 99 species of fishes reported in the literature from the Youghiogheny River. Six species collected (*Amia calva*, *Carasius auratus*, *Erycymba buccata*, *Notropis rubellus*, *Ictalurus catus* and *Fundulus diaphanus*) established new distributional records for the Youghiogheny River bringing the total to 105 species. Seventy-eight of these species were verified by our collections (56 species), museum records (11 species) or stocking records (11 species), while 27 could not be verified. Of the 27 unverified species, 21 are expected to occur and 6 are considered misidentifications or erroneous records. An additional 23 species are expected to occur in the Youghiogheny based on their distribution in the Monongahela or Allegheny rivers.

The majority of the ichthyofauna of the Youghiogheny River was derived from Teays River by dispersal up the newly formed Ohio River after the onset of Pleistocene glaciation. Two species, *Clinostomus elongatus* and *Catostomus catostomus*, dispersed into the Youghiogheny from the north during the Pleistocene. *Rhinichthys a. atratulus* dispersed into the Youghiogheny from the Potomac River via stream capture. Several species: *Camptostoma anomalum anomalum*, *Erycymba buccata*, *Noemius micropogon*, *Notropis spilopterus spilopterus*, *Etheostoma blennioides blennioides* and *Percina caprodes caprodes*, may have used either of two Youghiogheny-Potomac stream capture areas as dispersal routes eastward into the Atlantic slope.

(105)

Temporal Regulation of Membrane Protein Synthesis in *Chlamydomonas reinhardtii*

DAVID HERRIN, ALLAN MICHAELS AND EILEEN HICKEY
University of South Florida

Thylakoid membranes isolated from synchronous, wild type cells following chloramphenicol treatment (to prevent run-off of attached polysomes) were added to an *in vitro* protein synthesizing system. Membranes isolated during the light period of the cell cycle stimulated the *in vitro* system 2.5-4 fold. Profiles of the polypeptides synthesized by membranes isolated at different points in the light were similar, except for a Mr 29000 species. *In vivo* labeling of synchronous cells with 3H-arginine gave similar results. We conclude that some thylakoid membrane proteins are synthesized on membrane-bound ribosomes and their synthesis is temporarily regulated in synchronous cell cultures. *Supported by NSF grant No. PCM 77-14695.*

(106)

Floristics of Hard Labor Creek State Park — A Microcosm of Piedmont, Georgia

JOSCELYN W. HILL
University of Georgia

Hard Labor Creek State Park is located in the Lower Piedmont of Georgia. Consisting of 5,806 acres (2350.6 ha), it is the largest state park in Georgia and takes its name from the stream that cuts an easterly course within its boundaries. In the 1930's this land was acquired by the U.S. Park Service to demonstrate the restoration of sub-marginal farm land for recreational use. It was given to the State in 1946. Approximately 50% of the park had been intensively cultivated as was typical of the Piedmont; however, near-original growth occurs in areas too steep for cultivation. A microcosm of Piedmont Georgia, this study area offers a unique area for a floristic study long neglected by taxonomists. Few collections have been made and little is known of the species diversity. Species diversity and phytogeographical implications will be reported.

(107)

Food Selection by Two Sympatric Species of *Notropis* (Pisces)

JAN JEFFREY HOOVER
University of South Florida

Juvenile and adult *Notropis petersoni* and *N. hypselopterus* occur sympatrically in swift portions of the Hillsborough River (Florida), feeding from epidendric aufwuchs. The larvae are found downstream in quiet, shallow water where they feed upon epibenthic aufwuchs. These two habitats were sampled and fish guts examined in order to determine the degree of food selection by the two shiners. Both species of larval shiners were selective for *Closterium* (Chlorophyta) and very highly selective for Rotifera. Total diatoms, present in large numbers, were rejected with some genera fed upon randomly. Juvenile and adult *Notropis petersoni* exhibited

preferences for Pelecypoda and Hydropsychidae (Trichoptera) and rejected the mayfly, *Tricorythodes*. *Notropis hypselopterus* avoided feeding on diatoms and *Tricorythodes*, but actively selected Cladocera and Dip-tera. Prey size, predator size, seasonality and nutritional value of prey were demonstrated as factors influencing electivity. Ramifications of selectivity on trophic niche overlap will be discussed.

(108)

Population Dynamics and Production Ecology of Crayfish in a Central Kentucky Limestone Stream

KATHERINE H. HOUP AND ROBERT A. KUEHNE
University of Kentucky

The crayfish, *Orconectes rusticus* (Girard), is often the dominant member of limestone stream communities in central Kentucky. An undisturbed headwaters population of this species was studied to obtain answers to the following questions: 1) What is the population density?; 2) How does the age-sex structure of the population change on an annual basis?; and 3) What is the production of this species, and how is it distributed per age class and microhabitat?

The population was sampled over a two-year period, individual growth rates were measured in a laboratory population and caloric values were obtained by oxygen bomb calorimetry. The study showed for *O. rusticus* 1) a maximum density of 2.6 individuals/m², 2) that young were recruited into the population in late May, 3) a tentatively estimated natality rate of 40/adult female/yr and 4) an expected life span of 2.5 yrs. Caloric values of small, medium and large crayfish were 3.8, 4.8 and 4.7 kcal/ash-free gram dry weight, respectively.

(109)

Vegetation Characteristics of Dredge Spoils along the Mississippi River in Illinois, Iowa and Missouri

J. S. HOWE
Southern Illinois University, Carbondale

A vegetational study was made from 1976-1978 on 15 dredge disposal sites along the Mississippi River between Burlington, Iowa and Canton, Missouri. Three main types of dredge spoilage ranging from zero to 28 years were sampled: sand spoilage on forested sites; sand spoilage forming new terrestrial habitats; and rock spoilage providing new terrestrial habitats. Dredge spoilage deposits on forested sites at low elevations supported thick growth of vines after three years. Moist sand spoilage supported dense stands of wetland herbs with variation in density related to the amount of wave disturbance. Dry spoilage at all sites supported sparse weedy communities composed of a variety of native and nonindigenous herbaceous species. Plant succession in the dry spoilage sites tended to remain at the third year stage for 22 years or more after deposition. Soil moisture was determined to be the most influential environmental factor affecting vegetation and plant succession on dredge spoilage.

(110)

Tyrosineaminotransferase During the Ecdysial Cycle by the American Cockroach

MICHAEL E. HUME AND RICHARD R. MILLS
Virginia Commonwealth University

Tyrosineaminotransferase (TAT) is active during the interecdysial cycle but does not function during the immediate ecdysial period. The enzyme is present but tyrosine is routed into dopa via tyrosine hydroxylase or a non specific tyrosinase. Tyrosine is also converted to tyramine by L-aromatic amino acid decarboxylase. Both dopa and tyramine are metabolized to dopamine which is subsequently n-acetylated to n-acetyldopamine.

Tyrosine aminotransferase has been partially purified and characterized. Molecular sieve separation followed by ion exchange chromatography results in a 20 or more fold purification. Circadian rhythms of TAT activity have been investigated and diurnal fluctuations appear. SDS electrophoresis of the partially purified enzymes shows the dissociation into a number of components.

(111)

The Effect of Temperature on the Heart Rate-Ventilatory Response in the Copperhead, *Agkistrodon contortrix* (Reptilia: Viperidae)

JAMES S. JACOB AND STEVEN L. CARROLL
Memphis State University

The effect of temperature on the heart rate-ventilatory response was examined in *Agkistrodon contortrix*. The heart rate-ventilatory response in snakes has been shown to consist of an instantaneous increase in heart rate during ventilatory periods. Electrocardiographic and ventilatory activity of the copperheads was monitored over a temperature range of 4-30 C. There was a significant difference in heart rate between apneic (non-ventilatory) and ventilatory periods at temperatures between 4 and 25 C, but not at 30 C. Atrioventricular conduction time, represented by the PR interval of the electrocardiogram, showed no significant difference between apneic and ventilatory periods, regardless of temperature. The duration of ventricular depolarization, indicated by the length of the RT interval, showed significant differences between apneic and ventilatory periods at 6, 10 and 25 C, but not at any other temperatures. The percentage increase in ventilatory heart rate over apneic heart rate was greater at lower temperatures. Heart rates and ventilatory rates increased as the body temperature of the snakes increased. The heart rate-ventilatory response appears to be more prominent at lower temperatures. Abolition of the response occurred at high temperatures or when a snake exhibited high ventilatory rates.

(112)

The Effect of Rainfall During the Breeding Season on the Harvest of Cottontails

DAN JACOBS AND K. R. DIXON
Appalachian Environmental Laboratory

The effect that precipitation during the breeding season may have on the harvest of cottontail rabbits (*Syl-*

vilagus floridanus) was examined. The dependent variable was the standardized hunter harvest for six tracts of land and the independent variables were the amounts of rainfall per month during the breeding season. Multiple regression analysis indicated that rainfall during the months of May, June and July, the middle of the breeding season, was significant. Rainfall at this time reduces the number of male-female interactions at a time when both sexes are at their peak fertility. This may cause a reduction in the number of cottontails subsequently harvested in the fall. Further analysis indicated that in order for the breeding population to be affected there may be a threshold level of rainfall necessary (27 cm, cumulative).

(113)

Commensal Polynoid Polychaetes from North Carolina

CHARLES E. JENNER AND STEPHEN L. GARDINER
University of North Carolina

Many members of the polychaete family Polynoidae live commensally with other invertebrates. We know of six commensal species of this family from the North Carolina coast. These are listed here with their hosts: *Lepidasthenia varia* Treadwell with *Notomastus lobatus* Hartman (Polychaeta); *Lepidametria commensalis* Webster with *Amphitrite ornata* Verrill (Polychaeta); *Malmgrenia lunulata* (Delle Chiaje) with *Micropholis gracillima* (Stimpson) (Ophiuroidea); *Lepidonotus inquilinus* Treadwell with *Marphysa sanguinea* (Montagu) (Polychaeta); *Lepidonotus sublevis* Webster with four species of hermit crabs (Crustacea, Anomura) and with *Astropecten* sp. (Asteroidea); and an unidentified polynoid with *Polydonte lupinus* (Stimpson) (Polychaeta).

Lepidametria commensalis and *Lepidonotus sublevis* are already well known as commensals. The *Lepidonotus inquilinus*-*Marphysa* association has been reported previously only from Key West Harbor, Florida, by Treadwell (1917), and the other polynoid commensal associations we have found in North Carolina are new discoveries.

(114)

Complex Sorting in an *Ilyanassa obsoleta* Population (Mollusca: Neogastropoda)

MARTHA G. JENNER
University of North Carolina

Although the mudsnail, *Ilyanassa obsoleta*, is a social animal that exhibits complex behavior, there have been no previous reports of truly active sorting in this species. During January and February, 1978, the snails at a North Carolina study site were scattered over the mud-flat and were unsorted by age, sexual history or parasitism. But in March, the snails were congregated into large, dense patches. A sample of 250 snails taken from one patch included 241 trematode parasitized individuals, but groups of 250 from two other patches contained only six and eight infected snails, respectively. Furthermore, in one of these non-parasitized congregations, all the snails were either immatures or new adults functioning sexually for the first time. In the other, 97% of the individuals were older adults that had functioned sexually during previous seasons. This sorting pattern strongly suggests the existence of a complex pheromone system in *Ilyanassa obsoleta*.

Genetic Variability in Three Species of *Spartina*

DANTON L. JOHNSON
College of Charleston

Reproduction and growth of *S. alterniflora* populations is predominantly asexual, although new areas are often colonized by seed. Previous electrophoretic studies indicate that genetic variability between and within *S. alterniflora* populations are virtually absent. The lack of detectable genetic variation, coupled with dispersion of sexually produced seed, suggests that *S. alterniflora* is a large self-fertilizing clone, or perhaps a few. By contrast, it has been reported that *S. patens* is polymorphic and exhibits microevolution in terms of habitat selection.

Three species of *Spartina* (*S. alterniflora*, *S. patens* and *S. cynosuroides*) that exhibit different reproductive strategies and occupy different niches in coastal environments have been analyzed electrophoretically to determine intra and inter specific genetic variability. *S. alterniflora* exhibits low genetic variability as compared to the other two species. Also, these three species share a number of common alleles. The prospect of pursuing the relationships of genetic variation and reproductive strategy to habitat characteristics in these three species is promising.

(116)

Calcium Concentrations in Stem Bark of *Quercus* spp.

JON D. JONES AND GEORGE T. WEAVER
Southern Illinois University, Carbondale

The distribution and quality of calcium was determined in an oak-mixed hardwoods forest in southwestern Illinois on loessial derived soils. Examination of calcium concentrations in the various tree component parts measured found it to accumulate significant amounts in stem bark in *Quercus* spp. Stem bark calcium concentrations were 83412 µg/g in *Quercus stellata*, 66140 µg/g in *Q. alba* and 31698 µg/g in *Q. velutina*. The presence of *Quercus* spp. in these forests contributes a significant quantity to the ecosystems nutrient standing crop. Other studies have also found high calcium concentrations in *Quercus* stem bark though magnitudes vary for different regional locations. Species composition, site and soil property differences are possible factors attributing to these regional differences. The consequences of the calcium removed by harvesting practices are discussed.

(117)

Inhibitory Effects of Isoxanthopterin on Tryptophan-5-Hydroxylase

MICHAEL JONES, L. BRUCE WEEKLEY AND
T. DANIEL KIMBROUGH
Virginia Commonwealth University

Previous studies have suggested isoxanthopterin may act as an inhibitor of tetrahydrobiopterin, the natural cofactor for tryptophan-5-hydroxylase. In this study,

isoxanthopterin was either injected intravenously or stereotactically injected into the third ventricle and the activity of tryptophan hydroxylase measured. A second study was conducted in an *in vitro* enzyme prep to determine kinetic parameters. The results suggest both intravenous and intraventricular isoxanthopterin reduces tryptophan hydroxylase activity, and the kinetic parameters indicate isoxanthopterin acts as a non-competitive inhibitor of tryptophan hydroxylase with respect to both tryptophan and the 6-methyl tetrahydropterin cofactor. Since under normal physiological conditions brain tryptophan hydroxylase is not saturated with either tryptophan or tetrahydrobiopterin, a non-competitive inhibitor would not significantly alter brain serotonin synthesis, assuming turnover is constant. This effect has been previously documented.

(118)

Worldwide Distribution of Pollen Types in *Vernonia* (Compositae)

SAMUEL B. JONES AND STERLING C. KEELEY
University of Georgia and
The Museum of Natural History, Los Angeles

Pollen grains of over 600 species of *Vernonia* were acetolyzed and examined by light microscopy and SEM. Grains were assignable to one of six basic morphological types on the basis of polar and equatorial views. Of the six pollen types, one was found to be well represented in both the New and Old Worlds. This was Type A, an echinolophate, tricolporate grain which may represent the ancestral pollen type for the genus. Types B and C are found almost entirely in the New World. These grains are subechinolophate and tricolporate. Both types are best represented in the Caribbean-Central American region where affinities among species groups are evident on megamorphological grounds as well. One small group of species with Type C pollen is also found in Africa. Type D pollen is found in one Brazilian group and in one species of Central America. This pollen is also subechinolophate, but has pores without furrows. Pollen types E and F are found in the Old World exclusively. The grains are highly geometric in appearance and are less spiny than grains of New World species. It is apparent from the distinct distribution of pollen types in *Vernonia* that evolution has proceeded independently in geographically separated members of the genus.

(119)

Effects of Protein-Free Diets on Aflatoxicosis in Mongolian Gerbils

S. P. JONES, T. D. KIMBROUGH AND G. C. LLEWELLYN
Virginia Commonwealth University

Adult male Mongolian gerbils, *Meriones unguiculatus*, were stressed on a protein-free diet and then allowed to recover on control diets having normal levels of protein. One half of the animals on the recovery diets received aflatoxin, a mold metabolite from *Aspergillus flavus* or *A. parasiticus*. The toxic diets for these animals contained 14 ppm mixed aflatoxins, B₁, B₂, G₁ and G₂. Protein deficient animals recovering with both aflatoxin and

non-aflatoxin treatments returned to their original body weights in 25 days. Following a second protein-free diet treatment and recovery, the animals did not do as well. Animals receiving aflatoxin for the second time failed to return to normal body weight and lethalties occurred. At sacrifice, liver histopathological evaluations failed to show substantial differences between aflatoxin and control animals. Aflatoxin-treated animals did have smaller lungs. Protein deficient-aflatoxin animals showed a decrease in teste and spleen organ weights. Liver weights were increased due to aflatoxin treatment. A protein deficient status in the gerbil appears not to provide significant protection from the expression of aflatoxicosis.

(120)

Pine Communities of the Savannah River Plant in Aiken, Barnwell and Allendale Counties, South Carolina

STEVEN M. JONES AND DAVID H. VAN LEAR
Clemson University

Pine community types were determined by a combined classification-ordination of samples (57, 0.04 ha plots) collected within the Savannah River Plant located in the upper Coastal Plain of South Carolina. Loblolly (*Pinus taeda*), longleaf (*P. palustris*) and slash (*P. elliotii*) pine were the major overstory dominants. The three species occur as pure and mixed stands in varying proportions. Natural pine communities were found across a wide range of soil-site conditions from xeric, excessively drained, deep sands to wet, mucky, alluvial floodplains. Plantations were limited primarily to upland, intermediate sites. The distribution of samples along the first axis of polar ordination appears to be related to this environmental gradient. The three major overstory types were classified into 13 understory-overstory types identified by characteristic understory species.

(121)

Threatened or Endangered Vascular Plant Taxa of Sumter National Forest, South Carolina

L. K. KIRKMAN AND R. C. CLARK
Southeastern Wildlife Services, Inc.

Results of a study of threatened or endangered plant taxa, founded by the U.S. Forest Service and conducted by Southeastern Wildlife Services, Inc., are reported. Data obtained indicate the distribution of typical habitats and occurrence of threatened or endangered vascular plants in piedmont and mountain areas of South Carolina. Specific information regarding the status of these taxa is included.

(122)

Habitat Patterns in a Small Mammal Community

J. THOMAS KITCHINGS AND DOUGLAS J. LEVEY
Oak Ridge National Laboratory

The utilization of microhabitats by four species of small animals (*Peromyscus leucopus*, *Ochrocomys nuttalli*, *Tamias striatus* and *Blarina brevicauda*) was studied

in eastern Tennessee. Microhabitats were quantified by measuring 11 characteristics which described the structural composition of the habitat surrounding the trapping grids. Multiple stepwise discriminant analysis was used to reduce the habitat data to orthogonal linear combinations that describe a multidisciplinary space containing species data. Soil compactability, stump and log density, presence of overstory trees and density of herbaceous cover were found to be the most important habitat parameters influencing the local distribution of the four species. Sponsored by the Office of Health and Environmental Research, U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation.

(123)

Revegetation of Reservoir Shorelines

C. V. KLIMAS AND H. H. ALLEN
U.S. Army Engineer Experiment Station
Vicksburg, Mississippi

Many Corps of Engineers reservoirs exhibit significant loss of shoreline vegetation due to periodic fluctuation in water levels. These denuded areas often are subject to severe erosion and their value as wildlife habitat is lessened. The establishment of native perennial plant species on these shorelines is dependent on the identification of species which can tolerate extended submergence during the growing season and, often, extended periods of drought. The Waterways Experiment Station has initiated field studies to test plant species which may be able to withstand these stresses. Field sites in Oregon, South Dakota and Oklahoma were established in 1979, and data from the first growing season are now available. Results from the Oklahoma study are presented in detail and may be applicable elsewhere in the southeast.

(124)

Spawning of Freshwater Drum (*Aplodinotus grunniens*) and Food Habits of Their Young from Ross Barnett Reservoir, Mississippi

LUTHER A. KNIGHT, JR.
University of Mississippi

CHARLES M. COOPER
USDA Sedimentation Laboratory

Freshwater drum (*Aplodinotus grunniens*) in Ross Barnett Reservoir, Mississippi, were studied during 1978 and 1979 to ascertain spawning habits, food preferences and the influences of selected physico-chemical conditions on spawning activities. Spawning began during the last week of April when surface water temperatures reached approximately 18 C and continued for about five weeks. Low multiple R values (0.0422 to 0.7575) indicated that predictability by multiple regression was not possible although values for temperature and turbidity showed tendencies toward positive correlations. Food for larval drum under 10 mm TL (Total Length) consisted mainly of the cladoceran, *Holopedium*, and to a lesser extent *Daphnia*, diatoms, rotifers and copepod nauplii. Drum from 11 to 30 mm TL usually selected *Daphnia* and other cladocerans while diets of those from 31 to 75 mm TL consisted of insect larvae including *Hexagenia* and chironomids. Supported in part by D-J

(126a)

Reproductive Migrations of the Land Hermit Crab, *Coenobita clypeatus*

JAMES W. LANGDON

University of South Alabama

Female land hermit crabs, *Coenobita clypeatus*, make yearly reproductive migrations to the sea to release their zoea. On certain islands these migrations occur primarily on one or two consecutive nights of the year. Millions of crabs move en masse to the shore in a stream of individuals, sometimes in the past, forming a flowing ribbon approximately ten m wide by one m deep by 100 m or more long. Every year most crabs use the same path and have done so for decades, if not centuries. Ecological considerations relevant to the location of these paths will be considered.

(125)

A Study of the Larval Turrets of *Cicindela willistoni* (Coleoptera)

C. BARRY KNISLEY

Randolph-Macon College

The larvae of most species of tiger beetles live in burrows which open at the ground surface, but those of *C. willistoni* build small chimney-like structures or turrets that extend the burrows several centimeters above the surface. A study of this species in a southeastern Arizona playa suggests that turrets are perhaps most important in attracting potential prey which are blown out onto the playa by wind. Turret model (wood dowel rods) and macro-turret (metal cylinders) sticky traps captured 4-5 times more insects and spiders than plastic sheets of similar size placed flat on the ground. Determinations of microhabitat temperatures and larval activity showed a pattern of increasing larval activity during the day and decreasing burrow surface temperatures with increasing turret height. Turrets provide larvae with little protection against flooding of the habitat since turrets collapse readily when saturated.

(127)

The Role of Regional Climatic Extremes in Old-field Succession

ALBERT K. LANGLEY, JR.

Emory University and Dames and Moore Consultants

Various abiotic factors can cause changes within a plant community. A combination of circumstances allowed me to evaluate the role climatic extremes may play in altering old-field vegetational patterns. The Piedmont region of Georgia experienced an extremely severe winter during 1976-77, followed by two very dry spring growing seasons. The peak standing crop of vegetation in a broomsedge stage old-field decreased from 507 g/m² in 1975 to 289 g/m² in 1978. Similarly, the peak standing crop in a fescue pasture decreased from 574 g/m² to 250 g/m². The plant species composition of the two fields was also altered. Broomsedge dominated the old-field in 1975. However, by 1978 asters and goldenrods comprised up to 50% of the plant biomass in this field. A similar, though less dramatic, change occurred in the pasture. The role climatic extremes may play in successional processes will be discussed.

(126)

A Way to Meet the Peak Need of Large Classes

WILLIAM J. KOCH AND EUGENE R. WATSON

University of North Carolina

A learning-teaching model, "A Learner's Hierarchy of Needs," is designed to help us understand our roles as teachers and learners in real life situations and in college botany courses. The model is a spiral loop and has five levels: 1) Self-unrest, 2) Learning resources, 3) Freedom to explore, 4) Interactions with others and 5) Teaching others. There is feedback between all levels. How this model is applied will be explained with the "teach-in" as a small-group method taking the leading role. The basic course format: (a) subdividing the class into small learning groups, (b) teaching small-group skills, (c) semi-structuring the first half of the course's content and (d) having the small groups themselves determine the content and generate the activities for the last half of the course, during which time the instructor is available as a resource consultant and process guide. Our model says that no matter what it is, in order to learn its full meaning, the learner needs to teach it. As the learner gets reactions to his/her teachings, or feedback from his 'students,' new connections are made. New facts, ideas, concepts, applications and associations are attached to the old as a result of the interactions during teaching diverse people. The peak experience in learning is teaching, and the person who wants maximal performance as a student becomes a teacher of necessity, gaining the fullest possible assimilation, experiencing the greatest possible joy and picking up challenging new learning possibilities and learning needs in the process. The format we use is adaptable for many college teaching situations; e.g., we have a large-class version which also includes standard weekly lectures.

(128)

Uptake and Depuration of Four Polycyclic Aromatic Hydrocarbons by the American Oyster, *Crassostrea virginica*

RICHARD F. LEE AND MICHAEL C. MADDEN

Skidaway Institute of Oceanography and
University of Georgia

Oysters were exposed for 29 days to a water soluble fraction of Kuwait crude oil enriched with four polycyclic aromatic hydrocarbons (PAH). After the oysters accumulated high concentrations of the PAH, they were allowed to depurate in clean water for 47 days.

Liquid chromatographic analysis showed maximum tissue concentrations of 0.31 µg phenanthrene, 0.31 µg fluoranthene, 0.81 µg benz(a)anthracene and 0.22 µg benzo(a)pyrene per gram wet tissue weight. Tissue PAH concentrations reached the same levels as control oysters by day 47 of depuration except for benzo(a)pyrene.

The half-lives of the PAH in oyster tissue were calculated to be 7, 10, 11 and 11 days for phenanthrene, fluoranthene, benz(a)anthracene and benzo(a)pyrene, respectively, indicating a longer retention with increasing molecular weight.

(129)

Composition and Population Dynamics of Plankton in the Littoral Zone of Three Piedmont North Carolina Lakes

A. DENNIS LEMLY AND JOHN F. DIMMICK
Wake Forest University

Species composition and seasonal population dynamics of zooplankton and phytoplankton in the littoral zone were studied in three Piedmont North Carolina lakes from October, 1978, through September, 1979. Surface area of the lakes varied from 2 to 146 ha. Nygaard's trophic status indices indicated eutrophic conditions in two of the lakes and oligo-mesotrophic conditions in the other. Phytoplankton was most diverse in the oligo-mesotrophic lake. Species diversity of zooplankton was low, averaging only three species of Cladocera and two species of Copepoda per lake. A bimodal trend was observed in total zooplankton and phytoplankton numbers in each lake with peaks occurring in the spring and fall. There was very little difference in zooplankton species found between lakes but relatively large differences in phytoplankton. Monthly and seasonal fluctuations were greatest in zooplankton. Comparisons with limnetic plankton studies on North Carolina lakes indicate that seasonal fluctuations in littoral zone plankton are not similar.

(130)

Temperature as an Environmental Cue in Nesting Loggerhead Sea Turtles (Cheloniidae)

MARK S. LENARZ AND DANIEL L. STONEBURNER
University of Georgia

The means by which marine turtles locate nesting sites has been the subject of much speculation in recent years. Factors such as dune configuration, sand grain size, compressability and odor have been suggested as potential cues for nest selection. Observations of "sand nuzzling" behavior in several species of marine turtles lead to the hypothesis that temperature is the environmental cue which determines the nesting location. The hypothesis was tested by measuring sand temperature immediately behind loggerhead turtles (*Caretta caretta*) as they proceeded up the beach to nesting sites. The results of 28 temperature transects at three locations indicate that loggerheads begin nest digging immediately upon sensing an abrupt temperature rise of at least 2.0 C. In all 28 cases, turtles began digging after sensing this temperature change. The hypothesis will be further tested in the 1980 nesting season by artificially heating the sand in front of emerging loggerheads.

(131)

Cryptogamic Tardigrades of Sells Park, Athens County, Ohio

LORELEI S. LEVY
East Tennessee State University

Between September and late November, 1978, cryptogams were selected at random from trees and rocks in Sells Park, Athens County, in southeastern Ohio. Two replicates of each sample were soaked in tap water for 12-16 hours after which tardigrades were extracted and mounted for identification. Eight species representing four genera of the Eutardigrada (*Macrobiotus Hysibius*, *Diphyscon* and *Doryphoribius*) were found in five of a total 36 moss samples and two of a total 48 lichen samples. No Heterotardigrada were present. The number of species per sample ranged from 0-3 in both mosses and lichens; however, a total of seven species was present in moss samples and four in lichen samples. Two cosmopolitan species were common to both habitats (*Macrobiotus areolatus* and *M. echinogenitus*).

(132)

The Possibility of Palynological Distinction Among *Quercus* Species in Southeastern USA

MEREDITH H. LIEUX
Louisiana State University

Pollen grains (investigated with both light and scanning electron microscopy) of 17 *Quercus* species from southeastern USA have been included in a pollen atlas which is being published for that area. Grain sculptural pattern and size were used to separate the species into four types. There is apparently a correlation between the sculptural pattern of the pollen grain and its subgenus. The pollen grains of white oaks (subgenus *Leucobalanus*) tend to have a verrucate sculptural pattern whereas those of red oaks (subgenus *Erythrobalanus*) have a rugulate sculptural pattern with verrucae frequently among the rugulae and/or nanno-verrucae on the rugulae. Further investigation of *Quercus* pollen grains may allow identification of some to species level and thus contribute significantly to paleoecological interpretations in southeastern USA and elsewhere.

(133)

Dirofilaria immitis (Nematoda) in Stray Dogs from Richmond County, Georgia

BRUCE A. LINDEMANN AND J. W. MCCALL
University of Georgia

From April 4, 1978, to July 19, 1979, 88 stray dogs were examined for *Dirofilaria immitis* adults. All dogs were obtained from Richmond County, Georgia, and were microfilaria positive for *D. immitis*. For all dogs, mean worm burdens were 8.01 ± 7.32 female worms (range 0-38) and 7.16 ± 7.91 male worms (range 0-54) for a mean total worm burden of 15.17 ± 14.59 (range 0-92). Female dogs averaged 7.67 ± 5.85 female worms and 6.0 ± 5.45 male worms for a mean total worm burden of 13.67 ± 10.64 . Male dogs averaged 8.19 ± 8.02 female worms and 7.76 ± 8.90 male worms for a

mean total worm burden of 15.95 ± 16.29 . Five dogs (3M, 2F) had no worms. Statistical analysis of worm burdens included the one sample Student's t-test ($\alpha = .05$) which revealed no significant difference between mean numbers of male and female worms in male or female dogs. The two sample Student's t-test ($\alpha = .05$) revealed that mean numbers of female worms and mean numbers of male worms did not differ significantly between male and female dogs.

(134)

Multiple Hemoglobin Polymorphisms of a Catfish, the Yellow Bullhead (*Ictalurus natalis* [Lesueur]), in Florida

THOMAS E. LODGE
University of Miami

Yellow bullheads, like many cold-blooded vertebrates, have several hemoglobins. This study involved an examination of variability in this array of multiple hemoglobins with emphasis on geographic variability in Florida. Hemoglobins were analyzed by starch gel and cellulose acetate electrophoresis. This species was found to have polymorphism of two kinds. First, some electrophoregrams were found to differ qualitatively with some specimens having some hemoglobins unlike those found in other specimens. Three such phenotypes were found. The second kind of polymorphism involves the relative amounts of each hemoglobin possessed by individuals all having the same qualitative set of hemoglobins. A system of ten hemoglobins found in all specimens from peninsular Florida was found to fall into one of five distinct, stable phenotypes, each characterized by a particular set of percentage amounts of each hemoglobin. Clinal differences in these phenotypes over the Florida peninsula may represent physiological adaptation to different environments.

(135)

Anthelmintic Efficacy of Parentally Administered Avermectin B_{1a} Against Induced Nematode Infections in Calves

CHARLES E. LONDON, E. L. ROBERSON AND
T. M. BURKE
University of Georgia

Avermectin B_{1a} was administered subcutaneously to calves which had been induced with gastrointestinal nematode parasites. Five calves served as nonmedicated (vehicle only) control animals while the remaining 15 were assigned to 3 treatment groups (5/group) which received 50, 100 or 200 μg avermectin B_{1a}/kg body weight. Total parasite reductions were 12.6, 67.8 and 93.8% respectively. An immediate transitory behavioral reaction to the vehicle was observed; a delayed slight inflammatory reaction occurred in those calves receiving the avermectin. Neither of the reactions was severe.

(136)

Reproductive Behavior of *Poecilia latipinna* Males Directed Towards Conspecific and *Poecilia formosa* Females (Pisces:Poeciliidae)

CAROL LUCKNER
Louisiana State University

Poecilia latipinna males exhibit three behavioral and morphological classes, Sneak males, Intermediate males, and High males. Sneaky males rarely display to conspecific females, Intermediate males display occasionally, and High males display frequently. The basic courtship pattern of all males is to Orient, Follow if the female is moving, Anal Nibble, and Thrust. When they occur, displays are usually performed between Orientation or Following and Anal Nibbling. *P. latipinna* males were also tested with *P. formosa* females. *P. latipinna* is one of the parental species of the hybrid gynogene *P. formosa*. Males who mate with *P. formosa* females waste gametes since the male chromatin is not incorporated into the progeny. Reproductive behavior directed towards *P. formosa* females is characterized by more Orientations and Followings and a smaller percent of Anal Nibblings leading to Thrusts. These results indicate that the males are discriminating against *P. formosa* females.

(137)

Multivariate Analysis of the Distribution of Mineral Nutrients and Organic Matter in Forest Floor Horizons in Relation to Forest Community Types

JEFFREY C. LUVALL AND G. T. WEAVER
Savannah River Ecology Laboratory and
Southern Illinois University, Carbondale

The relationships among the distribution of mineral nutrients and organic matter in the forest floor and upland forest community types in the Ozark Hills region in southwestern Illinois were studied using multivariate analysis. Species data and forest floor samples were collected from 112-0.04 ha randomly selected plots representing a spectrum of physiographic forms and aspects rather than preselected community types. Basal area, density and species composition appeared to be important in determining distribution of mineral nutrients and organic matter whereas physiographic form and aspect appeared to have little effect.

(138)

Seasonal Mineral Nutrient Distribution Patterns in *Typha latifolia* L. and *Typha domingensis* Pers. (Typhaceae)

JEFFREY C. LUVALL, D. C. ADRIANO, R. R. SHARITZ AND
T. C. CIRAVOLO
Savannah River Ecology Laboratory

Mineral nutrient distribution patterns in two species of cattail, *T. latifolia* and *T. domingensis*, were examined over a seven-month period beginning with initiation of growth in the spring to fall senescence in a South Caro-

lina reservoir. All plant units sampled were the current year's growth. Both species showed decreases in shoot concentrations of N, P and K with time and increases in Ca. Concentrations of Mg tended to remain fairly constant. Relative concentrations of nutrients in the shoots versus those in the rhizomes and roots shifted during the growing season; however, the pattern varied with the specific nutrient and species.

(139)

The Woody Vegetation of Goose Pond, a Floodplain Forest in Southern Illinois

MARK D. MACKENZIE AND PHILIP A. ROBERTSON
Southern Illinois University, Carbondale

The vegetation of the 35 ha Goose Pond area was studied using multivariate analytical techniques. DECORANA ordination using basal area produced only one interpretable gradient, a complex moisture gradient related to soil texture, soil aeration and depth of flooding. TWINSPLAN and MINFO classification of plots revealed 3 forest types: mesic, floodplain and swamp. The mesic forest is dominated by *Quercus alba*, *Q. rubra*, *Q. velutina* and *Carya glabra* and supports an average basal area of 26 m²/ha. The floodplain forest is dominated by *Liquidambar styraciflua*, *Quercus palustris* and *Acer rubrum* and supports an average basal area of 35 m²/ha. The swamp forest is dominated by *Taxodium distichum* and *Nyssa aquatica* and supports an average basal area of 59 m²/ha. Species richness values for the mesic, floodplain and swamp forests are 34, 32 and 12, respectively. The swamp forest is unique in that it represents what is thought to be one of the few virgin *Taxodium distichum* stands in southern Illinois.

(140)

The Culture of Toadfish (Batrachoidiformes: *Opsanus tau*) Leukocytes for Cytogenetic and Mutagenicity Studies

MICHAEL B. MADDOCK AND JANET J. KELLY
College of Charleston

A cytogenetic survey of fish in the Charleston, South Carolina, area was undertaken to identify species suitable for use as test organisms to assay for mutagenic and, therefore, potentially carcinogenic activity of chemicals in the aquatic environment. The oyster toadfish, *Opsanus tau*, was found to have a well differentiated karyotype with large chromosomes, and large numbers of quality metaphases were obtainable from cultures of toadfish leukocytes.

The feasibility of assessing mutagenic activity by sister chromatid exchange (SCE) analysis of dividing toadfish leukocytes exposed *in vitro* to known mutagen-carcinogens was evaluated. The SCE rate was significantly higher in cultures exposed to ethyl methanesulphonate than in control cultures. Evidence continues to accumulate that SCE analysis is a far more sensitive indication of cytogenetic damage than is conventional cytogenetic analysis. The prospects for a toadfish SCE assay applicable to mutagenesis testing in the field are encouraging.

(141)

Schistosomiasis in Saudi Arabia

M. MAGZOUB AND A. A. KASIM
University of Saudi Arabia

Recent studies showed that both types of urinary and intestinal schistosomiasis existed commonly in the western, northwestern, northern and southern regions of Saudi Arabia. Snail vectors *Biomphalaria arabica*, *Bulinus beccarii* and *Physa acuta* existed in small-sized habitats consisting of springs, wells, irrigation ditches, swamps, dams and pools. The rate of snail infection with mature schistosome cercariae was higher in Gizan (southern region), Khayber (northwestern region) and Wadi Fatimah (western region) areas. Lack of co-existence, in the same habitats, between the different snail species was noticed.

(142)

Some Effects of Differing Wavelengths of Light on Sexual Morphogenesis in the Ascomycete Fungus, *Glomerella magna*

H. R. MAINWARING AND R. L. ADAMS
Western Carolina University

Cultures of *Glomerella magna*, growing on lima bean agar, pH 5.5, at 25 C, were exposed for an 8 h photoperiod to a variety of light spectra provided by either black, blue or green fluorescent lamps. These lamps have distinct light transmission characteristics; black provides illumination from 300-403 nm, blue from 300-610 nm, and green primarily from 490-610 nm. As a further refinement, Corning glass filters of differing transmission characteristics were used to alter the wavelength ranges supplied to the fungus. The intensity of light delivered in these ranges was also varied. After 15 days the number of perithecia produced in each experiment was analysed with respect to the light regime to which the fungus was exposed. It appeared that radiation within the ranges 308-319 and/or 359-373 nm optimally stimulated perithecial growth and development. Certain combinations of light intensity and wavelength range appeared to be inhibitory.

(143)

Variation in Leaf Anatomy of Selected Species of *Carex* (Cyperaceae) Representing Three Subgeneric Sections

MARION R. MALLORY
West Virginia School of Osteopathic Medicine

DAN K. EVANS
Marshall University

Leaves of *Carex*, representing three subgeneric sections, were collected from wide spread localities and evaluated for anatomical variation. Leaf cross sections were observed in *Carex roscia*, *C. convoluta*, *C. socialis*, *C. retroflexa* and *C. texensis* (of section *Bracteosae*), *C. annectens* and *C. vulpinoidea* (of section *Multiflora*) and *C. frankii*, *C. squarrosa* and *C. typhina* (of section

Squarrosae). Among the quantitative characters measured were epidermal cell height, width and number per unit area, bulliform cell height and width, air cavity length, width and number per unit area as well as number of stomata per unit area. Polygonal graphs of these data exhibit a pattern of variation which is of taxonomic value among closely related species. Stepwise discriminant analyses of these taxa suggest that leaf anatomy is a more useful taxonomic tool at the section level than at the species level. Overall findings are in general agreement with the established classification based upon inflorescence and fruit morphology.

(144)

Changes in the Concentration of RNA, DNA and Protein in the Liver and Thymus of Rats with Increasing Age

C. A. MANEN

University of Alabama

The concentration of RNA, DNA and protein was determined in the thymus and livers of rats at various intervals from birth (day 1) to "old" (day 280). The concentration of both RNA and DNA in the thymus was maximal at day 20 and then declined to approximately 5% of this value at day 280. Protein increased until day 20 and then remained constant. Thymus weight/body weight ratios increased until day 40 and then remained constant. The amount of DNA in the liver declined to 5% of maximal values at day 280. RNA concentration increased 2-fold from day 0-20 and then declined. However, the amount of protein increased slowly with increasing age. These data support the hypothesis that the biochemical process of aging is associated with decreased concentrations of DNA and RNA and, in the thymus, suggests that "aging" may be the result of some specific control event.

(145)

Some Games Systematists Play

J. R. MASSEY AND J. F. MATTHEWS

University of North Carolina and
University of North Carolina, Charlotte

During our one semester plant systematics courses we use several games which serve a variety of purposes. The Scavenger Hunt, a group exercise, is used as an evaluation technique for phylogeny. As a small group activity, this game is enjoyed by the students, increases interaction between students and instructors and produces excellent results. The Plant Family Feud, a composite of the format of several popular TV game shows, is used as a review exercise. This activity adds variety, permits permutations of material and stimulates discussion. This game might also be used as a self-test. The use and/or construction of Polyclaves is an appropriate activity for classroom, laboratory or field exercises and may be used to present and apply theoretical aspects of identification, generate useful products and stimulate interest in plant systematics. Several types of polyclaves and their uses will be discussed.

(146)

Innate Resistance to Coccidia in Hybrids of Chickens and Guinea Fowl

GREG F. MATHIS AND L. R. MCDUGALD

University of Georgia

Hybrid birds were obtained after artificial insemination of leghorn chickens (*Gallus domesticus*) with semen from guinea fowl (*Numida meleagris*). Hybrid birds, guinea fowl and chickens were orally inoculated with *Eimeria acervulina* or *E. tenella*, which are specific for chickens, or with *E. grenieri*, which is specific for guinea fowl. Less than 1% of the sporulated oocysts passed through the hybrid birds without excystation. The feces were examined for oocysts for nine days. Oocysts were not found in the feces of the hybrid birds. The chickens passed oocysts of *E. acervulina* and *E. tenella*, but the guinea fowl did not. The guinea fowl passed oocysts of *E. grenieri*, but the chickens did not. Thus, the progeny of this intergeneric cross were not susceptible to coccidia from either parent and presumably to any species of coccidia. These results suggest that absolute resistance to coccidiosis (or other diseases) might be obtained in domestic animals through genetic manipulation.

(147)

A Comparison of Habitats for the Disjunct Fern *Pellaea* × *wrightiana*

JAMES F. MATTHEWS

University of North Carolina, Charlotte

Disjunct species which are considered as endangered or threatened may be, in some cases, growing in the wrong habitat. Unless some clear-cut evidence can be obtained to support a characterization of the habitat, conclusions as to what factors control the survival of the species are difficult to ascertain. *Pellaea* × *wrightiana* occurs in two different habitats in North Carolina. Studies of these habitats have not revealed, as yet, what factors are controlling these populations. Investigations of native populations in the southwest United States were made. Results of the comparison of the native and disjunct habitats will be presented.

(148)

The Life History of the Redfin Shiner, *Notropis umbratilus* (Pisces: Cyprinidae), in Mississippi

M. MELISSA MATTHEWS AND DAVID C. HEINS

Millsaps College

The reproduction of *Notropis umbratilus* (Girard) in Tallahalla Creek, Bayou Pierre Drainage System, Hinds County, Mississippi, was studied from May, 1979, through April, 1980. This report will include a description of the reproductive period, fecundity and egg size of *N. umbratilus*.

(149)

Critical Current Speeds and Microhabitat Use by
Percina roanoka and *Etheostoma flabellare*
(Percidae)

WILLIAM J. MATTHEWS
University of Oklahoma

In the upper Roanoke River, Virginia, *Percina roanoka* (Roanoke darter) and *Etheostoma flabellare* (fantail darter) are both common in swift water, but *P. roanoka* occupies significantly faster microhabitats than does *E. flabellare*. Additionally, adult *E. flabellare* are consistently taken at much higher current speeds than are juveniles. Laboratory flow chamber tests were designed to compare this differential use of habitats in the field to the ability of the darters to maintain position in flowing water without actively swimming against the current. The "critical current speed" endpoint indicated the limits of current speed at which darters could rest motionless on the substrate, holding position without expending exhaustive amount of energy. Ability of *P. roanoka* and adult and juvenile *E. flabellare* to hold position in the laboratory flow chamber coincided completely with their microhabitat use in the field. Behavioral and morphological features related to the ability of darters to occupy swift water habitats were evaluated.

(150)

The Clark Creek Natural Area

LUCILE M. MCCOOK
University of New Orleans

The Clark Creek Natural Area in Wilkinson County, Mississippi, is a 427 acre tract of land within the Tunica Hills, the southern-most extension of the Blufflands. The Natural Area borders the eastern escarpment of the Mississippi River alluvial valley and contains considerable eolian loess which has eroded to form precipitous ravines, banks and cliffs. Conditions during maximum Pleistocene glaciation promoted the southward displacement of numerous species along the Bluffland pathway from the Mixed Mesophytic Forest of the Appalachian Mountains. The unique climate, geology and topography of the area has resulted in the persistence of numerous relict plant species in the cool, moist conditions of Clark Creek and the surrounding Blufflands.

(151)

Of What Size Should Sample Plots in
Maritime Tundra Be?

RAYMOND A. MCCORD AND EDWARD E. C. CLEBSCH
University of Tennessee

The predominance of asexual reproduction in the flora of maritime tundra produces vegetation that is difficult to sample by the traditional means of counting and measuring. We listed vascular plant species in eight concentric circular bands ranging in radius from 1/4 to 6 m in each of 14 sites from a wide range of community types on Adak Island, Alaska. Spatial homogeneity within and between plots was tested. The effect of increasing sample area on species-area and species-abun-

dance curves was studied, and consistency of the relationships was used to evaluate sampling adequacy. Cluster analyses for species and communities were also studied for the different sample sizes.

The species-area curves generally fit classical shapes. Species-abundance curves are lognormal. A minimum sample of a 4 m circle is recommended for most expressions of maritime tundra. Cluster analyses for species and communities further amplify this conclusion.

(152)

Species of the *Calcar* Group of *Leiobunum*
(Arachnida:Phalangida)

CHARLES R. MCGHEE
Middle Tennessee State University

Leiobunum calcar (Wood, 1868) was described from a male reportedly collected in the mountains of southwestern Virginia. Several species, morphologically related to *L. calcar*, constitute a theoretical phyletic complex referred to herein as the *Calcar* group. Considerable variation occurs within the species. Traditionally, *Leiobunum* specimens bearing a "spur" on the male pedipalpal femur have been labeled *L. calcar*. It is now clear that the spur adorns several species of the group, is morphologically variable and provides but one of several characters for taxonomic interpretation. Geographic variation within populations of *L. calcar* from the eastern United States is demonstrated. Taxonomy of the *Calcar* group can advance subsequent to a more precise delimitation of Wood's *L. calcar*. In the absence of any known type, a neotype designation, utilizing a specimen from the mountains of southwestern Virginia, is proposed.

(153)

Pathogenicity of the Fungus *Leptolegnia* sp.
(Oomycetes) for Mosquito Larvae

THOMAS MCINNIS AND WILLIAM ZATTAU
Clemson University

A new fungal pathogen of mosquito larvae, *Leptolegnia* sp., has been isolated and characterized. Second instar larvae of *Aedes aegypti*, *Culex quinquefasciatus*, *Anopheles albimanus* and *A. quadrimaculatus* are all readily infected, suffering nearly 100% mortality within three days of exposure. Larval age and water temperature, pH and salinity all affect the infectivity of the fungus. The results of these infection studies indicate the fungus has potential as a biological control agent for mosquitoes.

(154)

Revegetation of Thermally Altered Swamp Forest

K. W. MCLEOD AND C. SHERROD, JR.
Savannah River Ecology Laboratory

For 15 years, thermal effluents were introduced into Steel Creek, located on the Department of Energy's Savannah River Plant. Drastic alteration of the forest occurred during this period with complete loss of the canopy trees. Succession following cessation of thermal

effluents in this totally open habitat has been slow and developed more similar to an isolated semi-aquatic habitat, rather than a continuous swamp forest. It is important to determine if the establishment requirements for the formerly dominant species are met by the "new" Steel Creek habitat. Studies investigating the germination and seedling growth of *Nyssa aquatica*, *Salix nigra* and *Taxodium distichum* will be discussed. It appears from the results of these studies that dispersal mechanisms are responsible for creating a biotic environment which has restricted the establishment of the formerly dominant species, water tupelo and baldcypress.

(155)

Utilization of the Surf Zone Habitat of Horn Island, a Barrier Island Off the Mississippi Coast, by the *Menticirrhus* Complex (Pisces, Sciaenidae)

ROBERT MCMICHAEL, JR. AND STEPHEN T. ROSS
University of Southern Mississippi

The three species of *Menticirrhus* common to the eastern United States coast and the Gulf of Mexico, *M. americanus*, *M. littoralis* and *M. saxatilis*, were collected for 16 months in the surf zone of Horn Island, a barrier island off the Mississippi coast. A total of 1192 *Menticirrhus* were collected ranging in size from 5 mm to 260 mm S.L. *Menticirrhus littoralis* was the most abundant species making up 62% of the total number of *Menticirrhus* followed by *M. americanus* with 21.9% and *M. saxatilis* with 15.5%. *Menticirrhus americanus* and *M. saxatilis* were most abundant in the spring and early summer while *M. littoralis* was most abundant in mid and late summer.

The food habits of these fishes were determined by recording the % occurrence, % number and % volume of each prey item and then multiplying the sum of the % number and the % volume by the % occurrence to form an importance value. There was a marked change in food habits associated with an increase in fish length within all three species. Bivalve siphon tubes (*Donax*), mysids and cumaceans were the most important food items for small *M. littoralis* and *M. americanus* (< 80 mm S.L.), while cumaceans, mysids and copepods were the most important food items for *M. saxatilis* less than 70 mm S.L. Larger *M. littoralis* (> 80 mm S.L.) fed primarily on brachyuran crabs and whole *Donax*. *Emerita* were found in all size classes within *M. littoralis*. Larger *M. americanus* (> 80 mm S.L.) fed primarily on brachyuran crabs and amphipods, while large *M. saxatilis* fed primarily on brachyuran crabs and fish. Polychaetes were of major importance to all three species for all size classes.

(156)

Seasonal Testicular Cycle of the Stinkpot Turtle, *Sternotherus odoratus*, in North Central Alabama (Reptilia:Chelonia)

ROGER J. MCPHERSON, GARY R. POIRIER AND
KEN R. MARION
University of Alabama, Birmingham

The seasonal testicular cycle of *Sternotherus odoratus* was studied using monthly samples captured during 1979 in Jefferson County, Alabama. Histological examination of the testes revealed that spermatogenesis begins

in May and peaks during September and October. The seminiferous tubules of winter animals were found to contain only germinal cells with mature spermatozoa present in the lumen. Sperm were found throughout the year in the epididymides. Testes weights reached maximum levels during late summer and were lower during winter. Males were observed copulating from September through early November. Seasonal reproductive events of *Sternotherus odoratus* are correlated with environmental parameters and compared to cycles of kinosternids in other geographical areas.

(157)

Effects of Lithium on *Phaseolus vulgaris* L.

N. G. MCSTAY, H. H. ROGERS AND C. E. ANDERSON
Atmospheric/Vegetation Effects Research,
AR-SEA-USDA and
North Carolina State University

The effects of lithium (Li) in growth medium on *Phaseolus vulgaris* L. cv. 'Bush Blue Lake 290' (snap-bean) was studied under controlled environmental conditions. Toxic symptoms were produced at concentrations of 4 ppm Li in substrate. The development of these symptoms is discussed and measurements of certain growth parameters presented. Growth stimulation was observed at 4 ppm. Stomatal diffusive resistance was increased at concentrations greater than 4 ppm indicating Li induction of partial stomatal closure. Usual stomatal function resumed after 5 days.

(158)

Immune Response in Guinea Pigs to Feeding of Various Ixodid Ticks

TOM L. MCTIER, JOHN E. GEORGE AND SARA N. BENNETT
Georgia Southern College and
USDA, ARS-SEA, U.S. Livestock Insects Laboratory

Guinea pigs developed resistance to feeding of the ixodid ticks *Dermacentor andersoni* and *Amblyomma americanum* after a series of larval infestations. Resistance was measured as a significant reduction in numbers and/or mean weights of larvae engorging from initial through subsequent infestations. Data indicate that an interspecific cross resistance is manifest in guinea pigs. Salivary gland antigen from females of 3 species of ixodid ticks stimulated various degrees of delayed skin reactivity when injected intracutaneously into tick resistant guinea pigs.

(159)

Why Have a Speckled Toad Lily in Your Greenhouse: Evaluating Living Collections for Teaching Botany and Horticulture

T. LAWRENCE MELICHAMP
University of North Carolina, Charlotte

Many universities and colleges have greenhouses associated with their biology departments. Historically these greenhouses have been a place to store living plant specimens which were routinely used in general botany courses and included such standards as Boston ferns,

snake plants, geraniums, a few ragged coleus and some underwatered succulents — plants which could survive on neglect. The care of the plants was usually given low priority because no one had the time nor the knowledge to deal with them properly. I maintain that living collections are one of the most important assets to the dynamic teaching of botany; and, as more schools offer courses in horticulture and practical botany, living plants for propagation and demonstration are absolutely necessary. In effectively utilizing the greenhouse, thought must be given to choosing plants which meet as many of the following criteria as possible: 1) usefulness in demonstrating morphological structures, 2) ability to produce typical flowers on a regular basis, 3) ease of culture and propagation under your conditions and 4) representing broad diversity rather than just another cultivated plant. Setting up schedules, providing routine maintenance and making efforts to acquire and evaluate new plant types should result in a more satisfactory utilization of precious greenhouse space as well as producing a more attractive and valuable collection of living plants.

(160)

Aruncus dioicus (Rosaceae) as the Foodplant of the Rare Dusky Blue Butterfly, *Celastrina ebenina* (Lycaenidae)

T. LAWRENCE MELLICHAMP
University of North Carolina, Charlotte

Goatsbeard [*Aruncus dioicus* (Walter) Fernald] is a well-known herbaceous perennial found in rich hardwood forests and along north-facing, shaded roadbanks in the Southern Appalachians and westward. It was recently discovered to be the larval food-plant of the little understood Dusky Blue Butterfly (*Celastrina ebenina* Clench). Several new localities for the butterfly have recently been discovered in western North Carolina. Earlier laboratory investigations have shown that *C. ebenina* is monophagous on *Aruncus dioicus* with the larvae feeding mainly on the leaves. In the field however, *C. ebenina* is seen to feed mainly on very young flower buds to the extent that several feeding larvae can drastically reduce the number of buds reaching anthesis on a single individual of *Aruncus*. Field observations have been tabulated to show egg-laying habits of *C. ebenina* in terms of number of eggs laid per inflorescence and distribution of the eggs between male and female shoots of the dioecious *Aruncus*. The behavior of the butterfly and its effects on the host population will be discussed.

(161)

Genome Relationships of Some African Species of *Hibiscus* sect. *Furcaria*, Including Kenaf and Roselle (Malvaceae)

M. Y. MENZEL, S. G. GOETZ AND C. A. HASENKAMPF
Florida State University

D. W. MARTIN
Rutgers University

Eight of the nine diploid species and the greatest diversity of allopolyploids in *Hibiscus* sect. *Furcaria* ($x = 18$) occur in sub-Saharan Africa. Interest in *H. cannabinus* L. (kenaf) and *H. sabdariffa* L. (roselle) as fiber and

pulp crops stimulated study of genome relationships among the African species. Data from interspecific hybrids placed African diploids into three genome groups: A (*H. asper* Hook f., *H. cannabinus*, *H. greenwayi* Bak.); B (*H. surattensis* L.); and G (*H. sudanensis* Hochr.). In addition, *H. hiernianus* Exell and Mendonca and *H. mastersianus* Hiern have homologous genomes which are nonhomologous with that of *H. mechowii* Garcke. Three African tetraploids combine A genomes with different other genomes: *H. acetosella* Welw. ex Hiern (AB); *H. meeusei* Exell (AX); and *H. sabdariffa* (AY). Morphological traits suggest that *H. mechowii* carries Y and *H. hiernianus* and *H. mastersianus* carry X. Supported in part by A. E. C. Contract At-(40-1)-3348 and U. S. D. A. Cooperative Agreement No. 12-14-7001-1406.

(162)

Tryptic Digestion of Membrane Proteins Synthesized on Chloroplast Ribosomes in *Chlamydomonas reinhardtii*

ALLAN MICHAELS AND JOHN T. SEXTON
University of South Florida

Chloroplast membranes of the green alga, *Chlamydomonas reinhardtii*, have been isolated from cells incubated in the presence of cycloheximide. The proteins produced under these conditions are formed on chloroplastic ribosomes. Fluorography of the polypeptides separated on polyacrylamide gels shows ten major protein species associated with the membranes that are produced on chloroplast ribosomes. These membranes were subjected to *in situ*, differential proteolysis. The change in electrophoretic mobility of the membrane proteins after controlled digestion indicates that proteins of molecular weight 55,000, 43,000 and 30,000 are buried in the membrane. Most, if not all, of the chloroplast synthesized thylakoid proteins contain tryptic sensitive sites accessible from the stromal (out)-side of the isolated membrane vesicle. Supported by the National Science Foundation Grant No. PCM 77-14695.

(163)

Morphometric Analysis of Gulf Coast Populations of *Enneacanthus gloriosus* (Centrarchidae)

GARY L. MILLER AND GLENN H. CLEMMER
Mississippi State University

Meristic counts and morphometric measurements were taken on specimens of *Enneacanthus gloriosus* from four populations from Florida, Alabama and Mississippi. The Mississippi population from Bluff Creek in the Pascagoula drainage represents the westernmost range of the species. Little variation in meristic counts was observed. Multivariate Analysis of Variance indicated significant differences in the morphometric composition of the four populations. Clinal variation in allometric growth was observed with respect to many of the characters measured. Discriminant analysis indicated that the populations were most distinguishable by head length dimensions and orbit size. Classification procedures showed the Bluff Creek population to be strongly isolated morphometrically with respect to these characters.

(164)

The Life Cycle, Longevity and Transmammary Transmission in the Genus *Pharyngostomoides* (Trematoda:Diplostomatidae)

GROVER C. MILLER

North Carolina State University

The genus *Pharyngostomoides* includes unusual trematode parasites in the intestine of the raccoon (*Procyon lotor*). Life history studies indicate that transmammary transmission is one mode of infection. This appears unusual for digenetic trematodes although the phenomenon is known to occur with tetrathyridia of the cestode *Mesocostoides* and also certain nematodes. *Menetus dilatatus* is the snail host. We now have records of longevity and maternal transmission extending over a period of eleven years. Twenty-five raccoon offspring have been consistently infected with *Pharyngostomoides* each year through the sixth litter. There has been a declining number of worms in each litter, ranging from nearly 2000 in one of the first litters, to none in the seventh litter. Transmammary transmission of this nematode is a viable alternative in its life cycle, and raccoons are probably infected for life.

(165)

Growth Response of a Diatom, *Cyclotella*, to Gibberellin (GA₇)

MARGARET MILLER AND RUTH RAYBURN

University of South Alabama

The plant hormone, gibberellic acid type 7 (GA₇), has been found to effect the growth of a marine diatom, *Cyclotella*. Five different concentrations of GA₇ (5, 15, 20, 25 and 35×10^{-6} g/ml) were added to pure cultures of *Cyclotella*. The growth of *Cyclotella* was stimulated by the addition of GA₇ to the culture media with the greatest stimulation of growth occurring when GA₇ was added at the 20×10^{-6} g/ml concentration.

(166)

Evolution of a State Flora

ROBERT H. MOHLENBROCK

Southern Illinois University, Carbondale

This paper traces the development of the Illinois flora from the first exploration by Andre Michaux to the present time. It will detail chronologically the increase of adventive species within the State.

(167)

Acoustic Behavior of the Naked Goby, *Gobiosoma boscii* (Pisces: Gobiidae)

HIN-KIU MOK

Harbor Branch Institution, Inc.

Male *Gobiosoma boscii* emits clicking sounds under diverse interacting conditions including agonistic and non-aggressive interactions with other males. Sounds

are also produced during interactions with females which lead to further spawning activities even if courtship does not eventually take place. The recipients of these acoustic signals do not respond immediately but remain stationary in a non-aggressive posture. The sounds produced toward the mature females are usually associated with sight body shaking, pectorals flipping and rapid turning around. This performance frequently attracts the female, a response which in turn increases the repetition rate of sound production in the male. These behavioral patterns considered as a whole are not performed toward a male recipient. The acoustic signals alone or the signal association with the stereotypic behavior of the male may serve as an attractant to the gravid females. The observed response of the recipients to these signals make it plausible that they do not act as a threatening display.

(168)

The Isolation and Identification of a Natural Product Cytolytic Toward Florida's Red Tide Organism, *Ptychodiscus brevis* (Davis) Steidinger

RALPH E. MOON AND DEAN F. MARTIN

University of South Florida

A compound cytolytic toward Florida's red tide organism *Gymnodinium breve* (renamed *Ptychodiscus brevis*) has been isolated and identified. The compound is produced by the marine blue-green alga *Gomphosphaeria aponina* Kützing and extracted with chloroform from the seawater media. High pressure liquid chromatography (reverse-phase) separated one component with cytolytic activity toward the dinoflagellate. Mass spectral analysis of purified material identified the compound as a C₂₈H₄₆O. A molecular model of the compound is proposed based on the evaluation of UV-VIS, MS and IR analysis.

(169)

Eimeria tuskegensis (Protozoa:Eimeriidae) in the Cotton Rat, *Sigmodon hispidus*: Observations on Actively Induced Resistance

JAYMA A. MOORE, WILLIAM L. CURRENT AND JOHN V. ERNST

Auburn University and

USDA Regional Parasite Research Laboratory

Completed work indicates that cotton rats are completely resistant to reinfection with *Eimeria tuskegensis* after a single inoculation of 2000 or more oocysts of the same species. Resistance lasts at least four weeks. To determine what stages of the parasite were affected, experimental rats previously inoculated with 10,000 oocysts and control rats free of the parasite were challenged orally with 50,000 to 900,000 oocysts. Rats from each group were necropsied at 24-hour intervals and examined for parasite development. In control rats, sporozoites penetrated into intestinal epithelial cells and proceeded through the normal endogenous development of three generations of schizogony followed by gametogony. In experimental rats, sporozoites were apparently killed before penetrating the epithelial cells. The mechanisms responsible for inactivation of the infective sporozoite stage are now being investigated.

(170)

Asplenium × *shawneense*:
A Collective Epithet for
A. rhizophyllum × *A. trichomanes*

ROBBIN C. MORAN
Southern Illinois University, Carbondale

A previously unknown *Asplenium* hybrid is described for the first time. The hybrid was found in the Shawnee Hills of southern Illinois. Evidence from frond morphology and esterase isoenzyme, banding patterns support the view that *A. rhizophyllum* and *A. trichomanes* are the two parents involved.

(171)

Remote Buoy Applications for Automated Fish
Breath Rate Monitoring

E. L. MORGAN AND D. RENFRO
Tennessee Technological University

K. W. EAGLESON
North Carolina Department of Natural Resources

N. D. MCCOLLOUGH, JR.
Advanced Technology Corporation

Automated biosensing of fish breathing rates from remote stations may provide added advantages to the effectiveness and credibility of water quality monitoring programs. In addition to some of our more recent applications of automated biosensing to remote site-specific wilderness stations incorporating satellites for data retrieval and in automated toxicological assay systems, buoy devices have been developed that provide the alternative of free-floating fish biosensors. Buoys may house any number of preferred fish at selected depths and may be anchored or allowed to drift, depending upon the water system monitored and objectives. Buoys positioned in lakes and streams transmit breath rate information to microprocessor controlled signal receiving stations where interpretations and decisions may be made in light of concomitantly transmitted physical data. Applications, among others, include hazardous material spill monitoring and in-stream flow assessments. Supported by USDI, OWRT and Private Endowments, Environmental Biology Research Program, Tennessee Technological University.

(172)

Studies on Southeastern *Laccaria*

GREGORY M. MUELLER
University of Tennessee

Among the species of *Laccaria* Berk. & Br. found throughout the southeast are *L. amethystina* (Bolt. ex Hook.) Cooke, *L. farinacea* (Hud. ex S. F. Gray) Singer, *L. laccata* (Scop. ex Fr.) Berk. & Br., *L. ochropurpurea* (Berk.) Peck and *L. proxima* (Boud.) Pat. This facultative mycorrhizal genus exhibits potential for becoming a commercially important mycorrhizal inoculant. In addition to being reported as relatively easy to culture, its members form mycorrhizal relationships

with several economic tree species. Its widespread use as a mycorrhizal inoculum, however, has not been hastened because of taxonomic problems which persist in this phenotypically plastic genus. *Laccaria laccata* sensu lato is characterized morphologically by its small to medium size and its flesh-colored basidiocarp and anatomically by its globose to subglobose echinulate basidiospores. The other four species can be distinguished from *L. laccata* by the following morphological and anatomical characters: violet basidiocarp of *L. amethystina*; violet basal mycelium on the stipe of *L. farinacea*; violet lamellae, large size and robust stature of *L. ochropurpurea*; and reddish brown basidiocarp, robust stature and elongate, finely echinulate basidiospores of *L. proxima*.

(173)

Seasonal Changes in the Tardigrade Fauna,
Bays Mountain Park, Tennessee

D. R. NELSON, C. WILLIAMS, C. HOWARD AND
G. TUNNELL
East Tennessee State University

Samples of the moss, *Dicranum scoparium* Hedw., were collected in April, June and September, 1978, and February, 1979, to determine seasonal changes in tardigrade populations. The moss is a dominant component of the ground cover in the pine forest adjacent to the pond in the Bays Mountain Park, Sullivan County, Kingsport, Tennessee. In the spring, 10 moss samples contained 10 tardigrade species representing 6 genera; 0-3 species per sample were found. In the summer, a total of 25 moss samples yielded 6 tardigrade species representing 4 genera; 0-4 species per sample were present. Ten moss samples collected in the fall contained only one tardigrade species. In the 20 winter moss samples, 7 tardigrade species representing 4 genera were found; 0-4 species were present per sample. *Hypsibius convexus* (Urbanowicz) was the dominant tardigrade in the winter and spring. *Itaquascon placophorum* Maucci was the dominant species in the summer and fall.

(174)

Life History Aspects of *Etheostoma coosae*
(Pisces:Percidae) in Barbaree Creek,
Clay County, Alabama

PATRICK O'NEIL AND HERBERT BOSCHUNG
University of Alabama

This study examined life history aspects of the Coosa darter in Barbaree Creek (Coosa River System), Clay County, Alabama. Specimens were collected and observations were made from April, 1977, to April, 1978. The principal habitat of *Etheostoma coosae* consisted of cobble and or gravel raceways, riffles and pools. *E. coosae* reached sexual maturity and spawned in their first year. By the second spawning season, the average size of males and females was 41.0 mm and 36.5 mm SL, respectively. *E. coosae* were sexually dimorphic with males being larger and acquiring an iridescent aqua tint in the cephalic, dorsal, anal and caudal body regions. Total egg complement of gravid females ranged from 299 to 496. The spawning season was from mid-March to late May with peak activity in mid-April. The fish spawned on the surface of rocks and small boulders.

The spawning position was either inclined or semi-inverted horizontally. Longevity was three years. The principal diet consisted of Copepoda, Cladocera, Ephemeroptera (*Isonychia*) and Diptera (Chironomidae, Simuliidae). The sex ratio was 1:1.26. Demographic proportions indicated that the population was stable.

(175)

The Effects of Exogenous Progesterone on Fetal and Placental Size and Weight in Two Species of *Peromyscus* (Rodentia)

JENNIFER S. PALMER AND WALLACE D. DAWSON
University of South Carolina

The effects of exogenous progesterone on fetal and placental sizes and weights were compared in two species of *Peromyscus*. Hybrid crosses using a female *P. maniculatus* (M) are relatively productive with progeny and placentae smaller than those of the *inter se* crosses. Fertility and viability are greatly reduced in reciprocal hybrid crosses using *P. polionotus* (P) females. The F₁ progeny are generally resorbed about day 16, but both progeny and placentae are significantly larger than those of the *inter se* crosses. Fetal resorption corresponds to a fall in progesterone levels on day 16 of gestation.

Since differing levels of progesterone may result in reduction of fertility between the species, the effects of medroxyprogesterone on pregnant, nonlactating females were ascertained. Female *Peromyscus* were injected with 1.0 mg medroxyprogesterone daily from the time of implantation and compared to uninjected control groups. Mean fetal and placental sizes and weights were recorded. Preliminary data suggest that differences in the progesterone levels are not a major factor in determining fetal and placental sizes in these rodents.

(176)

A Vegetational Inventory of Ossabaw Island, Georgia

FREDERICK P. PARIANI AND JOHN R. BOZEMAN
Coastal Resources Division

TERRY D. HOLCOMB, NOEL Z. HOLCOMB AND
JERRY L. MCCOLLUM
Game & Fish Division
Georgia Department of Natural Resources

Ossabaw Island, the third largest barrier island on the Georgia Coast, was acquired in 1978 by the State through gift and purchase. Ossabaw is to be managed as a State Heritage Preserve. The objectives of this study were to compile environmental data to be used in the development of a management plan for the island. Beginning in fall 1978 and continuing through 1979 the vascular flora was collected, identified and representative voucher specimens placed in a resident herbarium. More than 400 species of vascular plants have been identified by various collectors as occurring on the island. A vegetation map was compiled from field reconnaissance, sampling, aerial reconnaissance and the study of historic maps, surveys and aerial photography dating back to 1933. Some 24 plant community/habitat mapping units are recognized. Permanent 20 × 50 m quadrats have been established to measure vegetational

changes. Man-induced vegetational influences to be discussed are: logging, feral stock grazing, draining of freshwater wetlands and road dams.

(177)

A Survey of the Mussels (Unionidae) of the Upper Tennessee River — 1978

W. JEFFREY PARDUE
Tennessee Valley Authority

This account of the mussels of the upper Tennessee River includes portions of the mainstream Tennessee River from Walden Gorge, west of Chattanooga, Tennessee, to Fort Loudon Dam, south of Knoxville, Tennessee. Collections were made downstream from each of the three mainstream dams (Fort Loudon, Watts Bar and Chickamauga) for varying distances depending on the quality of the substrate. Eighty-six stations were sampled which yielded a total of 21 extant species. Slight changes in faunal composition have occurred since Scruggs' survey (1960). Most notable of the changes are 1) invasion of typical post-impoundment species and 2) the occurrence of *Dromus dromas* (Lea, 1834), a Cumberlandian species not reported from the Tennessee River since Ortmann (1918).

(178)

Naegleria fowleri: Detection of Soluble Antigens by Counter Immunoelectrophoresis (CEP)

BRENDA W. PARKER AND T. W. HOLBROOK
Medical University of South Carolina

CEP was evaluated for detection of *N. fowleri* antigens which may be present in spinal fluid of infected human subjects. Rabbits were immunized by a series of intramuscular and intravenous injections of killed amebae from cultures. Antiserum was tested by CEP for detection of *N. fowleri* soluble antigens in chorioallantoic fluid (CAF) from infected chick embryos, medium used for axenic cultivation of amebae and spinal fluid taken at autopsy from a 1978 case of PAM. Soluble antigens were detected in embryo CAF and in medium from cultures but only when amebae were numerous prior to filtration. Concentration of amebae was 1.5×10^4 /ml in CAF and about 10^6 /ml in medium. No precipitin line was seen when antisera were reacted with human spinal fluid in which amebae were initially seen microscopically.

(179)

A New Centrarchid Host Record for the Paper Pond Shell, *Anodonta imbecillis* Say (Bivalvia: Unionidae)

ROBERT S. PARKER, MALCOLM F. VIDRINE AND
COURTNEY T. HACKNEY
University of Southwestern Louisiana

Four specimens of the longear sunfish (*Lepomis megalotis* (Raf.)) were artificially infected with glochidia from a paper pond shell mussel. Glochidia required approximately 7 days at 30 C to metamorphose and subsequently excyst from caudal and anal fins of the host fish. Glochidial attachment to gill filaments was

apparently unsuccessful under laboratory conditions. The 4 sunfish were collected from Bayou Peyronnet (St. Martin Parish, Louisiana) and the paper pond shell used in the infection was collected from an irrigation canal in Allen Parish, Louisiana. Although the longear sunfish and the pond paper shell are known to occur sympatrically, natural infections of this sunfish with glochidia of *Anodonta imbecilis* have not been observed by the authors. The longear sunfish is, however, a physiologically acceptable host for glochidia of the paper pond shell under laboratory conditions.

(180)

Chromium Incorporation in Soybeans (*Glycine max*) Through Root Uptake and Foliar Absorption Pathways

PATRICIA DREYER PARR AND FRED G. TAYLOR, JR.
Oak Ridge National Laboratory

The deposition of chromate transported in cooling tower drift has been identified as a potential environmental problem. Research at the Oak Ridge Gaseous Diffusion Plant (ORGP) cooling towers has provided quantitative evidence of the transfer of chromium from drift to vegetation and soil, its short-term effects on the vegetation and its possible accumulation in the soil. In this paper, the potential for incorporation of chromium in vegetation by root uptake and foliar absorption was studied using water from the chromated recirculating water system of the ORGP cooling towers. Concentration factors for roots (5.1-14.3) of plants grown in soil treated with chromated recirculating water were two orders of magnitude greater than concentration factors for leaves (0.05-0.20), indicating that the chromium was immobilized at the site applied (roots) and not transported to aboveground parts. Similarly, concentration factors in roots of the plants treated with foliar application of chromated recirculating water ranged from 0.01 to 0.10, indicating that the chromium was not transported basipetally. *Supported by the Office of Health and Environmental Research, U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation.*

(181)

Transmission of *Ophidascaris* (Nematoda: Ascarioidea) at the Knoxville Zoological Park

SHARON PATTON
University of Tennessee

Rodents are the accepted intermediate hosts of the *Ophidascaris* species that parasitize pythons and boas. Most investigators have maintained that transmission within a captive reptile population would be improbable or even impossible. This view is not supported, however, by the information gained from an *Ophidascaris* outbreak at the Knoxville Zoo. This parasite was associated with the death of six of fifteen adult pythons and boas from the zoo that were necropsied between October, 1978, and June, 1979. Several of the snakes had respiratory problems associated with the migrating stages of *Ophidascaris* as well as esophagitis and gastritis caused by more mature worms. Larval ascarids were removed from the lungs of two snakes which had been in the

reptile colony for several years. This suggests transmission at the zoo since the larvae are reported to migrate from the lungs to the esophagus approximately 117 days post-infection.

(182)

Comparison of Long Bone Development in Three Avian Species

D. I. PAV, L. J. ROBERTSON AND F. J. ALSOP
*East Tennessee State University and
Kingsport University Center*

A precocial species, the Japanese quail (*Caturnix caturix japonica*) and two altricial species, the red-winged blackbird (*Agelaius phoeniceus*) and the barn swallow (*Hirundo rustica erythrogaster*) were histologically examined in various age stages ranging from embryonic through adulthood. Special emphasis was given to development of epiphyseal plates and secondary ossification centers. Epiphyseal plates develop early postembryonically in both the precocial and altricial species. In the quail and the blackbird the growth plates are present and functional at fledging time; in the swallow the epiphyses are closed several days before fledging. In no avian species studied were any lapsed epiphyseal unions found in the adolescent birds. Unlike in mammals, secondary ossification centers form only sporadically: in the quail only in the proximal tarsometatarsus; in the blackbird and swallow in the distal tibiotarsus and proximal tarsometatarsus.

(183)

Development of Long Bones in *Plethodon glutinosus* (Plethodontidae)

D. I. PAV, R. J. STRAKER AND L. J. ROBERTSON
East Tennessee State University

Development of long bones has been studied in the lungless salamander, *Plethodon glutinosus*, a species native to eastern Tennessee. Forty-five salamanders were divided into nine relative age groups based on snout to vent ratio, and the cytomorphology of six limb bones was examined by light and electron microscopy in each age group.

Plethodon glutinosus forms distinct epiphyseal plates and marrow cavities with marrow elements in early immature stages. As the salamander matures, the epiphyseal plates become reduced in length with evidence of chondrocytic matrix mineralization, followed by endochondral bone formation and trabeculation. All epiphyseal growth plates persist through adulthood.

(184)

Flavonols of the Fern Genus *Dryopteris*: Systematic and Morphogenetic Implications

RAYMOND L. PETERSEN AND DAVID E. FAIRBROTHERS
Howard University and Rutgers University

Twelve eastern North American *Dryopteris* taxa were analyzed for their frond flavonol contents. A quercetin glycoside (Q) and two kaempferol glycosides (K1 and K2) were identified. It is proposed that the genus as it

occurs in North America be divided into two sections. The division is to be based on 1) flavonols present, 2) flavonol concentrations, 3) degree of frond dissection and 4) the incidence of found hybrids among the taxa. Section **Intermediae** consists of taxa containing flavonols Q and K1 at relatively low concentrations and having relatively high frond dissection. Section **Marginales** consists of taxa containing flavonols Q, K1 and K2 at relatively high concentrations and having relatively low frond dissection. The incidence of found hybrids is lower between taxa of these two sections than it is between taxa of the same section. As a result of these findings, a more ambiguous status is suggested for the hypothetical "S" genome of the "Semicristata" Scheme. Also, *D. intermedia* is presented as the most representative taxon of the ancestral genome and a flavonol control of leaf dissection is hypothesized.

(185)

Vegetation Changes in Shrub-Tree Communities of a Granite Outcrop

DONALD L. PHILLIPS
Emory University

Vegetation changes over time of shrub-tree communities were studied on Panola Mountain, a granite outcrop 30 km southeast of Atlanta, Georgia. Dominated by pines and/or hardwoods with an understory of small trees, shrubs and herbs, these communities occupy a terminal position in the sequence of increasing structural complexity of outcrop communities with increasing soil depth. Nine permanent 100 m² plots, established and described by others in 1970, were revisited in 1979. Density, frequency, basal area and importance value were determined for each species and compared with their previous values. In addition, increment bores of trees < 2.5 cm DBH were taken to determine the history of the stands and the age structures of the populations. Successional trends are discussed. During summer and fall, 1978, this area experienced a moderate drought. The level of drought-induced tree mortality was determined for the 9 plots and 12 other shrub-tree island communities. The importance of such periodic disturbances is discussed.

(186)

Systematic Implications of Isozyme Studies in *Hydrangea arborescens* L. (Saxifragaceae)

RONALD E. PILATOWSKI AND ROBERT L. BECKMANN
North Carolina State University

Hydrangea arborescens L., a deciduous shrub of the eastern United States, comprises three subspecies, *arborescens*, *discolor* and *radiata*, according to the treatment of McClintock (1957). Differentiation among these subspecies has been based on abaxial leaf vestiture, a character that has not proved universally reliable. In the present study, soluble protein profiles and isozyme patterns were evaluated as taxonomic characters. Populations of each of the taxa were examined with particular focus on the southern Appalachian region where the three taxa are sympatric. Representatives of each subspecies were transplanted and maintained in a greenhouse; protein extracts were prepared from leaf tissue. Soluble protein profiles and patterns of esterase (EST), leucine amino peptidase (LAP), glutamate oxaloacetate

transaminase (GOT) and peroxidase were developed by acrylamide gel electrophoresis. The utility of these molecular characters in both the differentiation of subspecies and in the description of intra- and interpopulational variability is discussed.

(187)

The Influence of Ostracods On Succession in Small Laboratory Freshwater Microcosms

MARY L. PITTS
University of Georgia

Freshwater ostracods were inoculated into replicate stock microcosms containing algae, protozoa, rotifers, fungi and bacteria, but no ostracods at different times during succession. Separate experiments were carried out with initial additions of ostracods in early, late and post-maturity stages of microcosm succession. Microcosm maturity influenced colonization success of ostracods with successful colonization resulting in altered community structure.

(188)

Climatic Changes at Augusta, Georgia, and the Biological Implications

GAYTHER L. PLUMMER
University of Georgia

A century of climatic data indicate clearly that cold-weather has become colder and warm-weather warmer, especially in wintertime. Although precipitation has been cyclic, or periodic, in several ways, rainfall now averages more than three inches less per year than that of a hundred years ago. Unusually cold weather in May has been associated with high sunspot activity, which affected crop production during certain years. Since 1920 pine-lands have increased and since 1955 the Coastal Bermuda Grass has been planted extensively. Coincidentally, high temperatures decline in summertime and incline in wintertime. Indicators are that if people plan for the gradual encroachment of a more droughty environment with more widely fluctuating thermal extremes, then life could be better, and possibly more comfortable, during the more mesic phases of the long-term trends.

(189)

Ultrastructure of "Extrafloral" Nectaries of *Pteridium aquilinum* L. (Polypodiaceae)

MARTHA S. POWER AND JUDITH E. SKOG
George Mason University

The stipes of *Pteridium aquilinum* L. bear nectaries which are located at the bases of the pinnae. These nectaries, functional only during the crozier stage of development, attract ants which appear to protect the young frond from herbivores. Croziers were collected at various developmental stages and their nectaries excised and preserved in glutaraldehyde. The secretory tissue of the nectaries was examined using both light and transmission electron microscopy. Some surface peel preparations were also made. These observations show

that the secretory tissues include parenchyma, phloem and epidermis. The epidermis consists of glandular trichomes, stomates and epidermal cells; the phloem contains sieve cells and parenchyma cells; the parenchyma tissue lies between the epidermis and the phloem. Possible pathways of nectar secretion are suggested in correlation with these tissues and their cellular organelles (mitochondria, plastids and microbodies). Cellular processes (exocytosis, pinocytosis and diffusion) for packaging and transport of nectar from phloem to epidermis are also considered.

(190)

A Chemotaxonomic Approach to the Fern Genus *Gleichenia*

ROBERT S. POZNER AND JAMES W. WALLACE
Western Carolina University

LUIS D. GOMEZ
National Museum, San Jose, Costa Rica

Flavonoid profiles are useful as diagnostic criteria in solving many complex taxonomic problems where classical morphological techniques prove to be inadequate. On morphological and cytological grounds the genus *Gleichenia* has been considered by some to contain five distinct genera, viz., *Gleichenia*, *Sticherus*, *Dicranopteris*, *Hicriopteris* (*Diplopterygium*) and *Platyzona* (*Acropterygium*). The present report indicates the usefulness of flavonoid profiles in delimiting the various subgroups of the family Gleicheniaceae.

(191)

Multiple Summer Molts in Adult *Orconectes neglectus chaenodactylus* Williams (Crustacea, Decapoda)

J. O. PRICE AND J. F. PAYNE
Memphis State University

Capture-recapture studies were made to determine the molting cycle, growth rate and population size class structure of the crayfish *Orconectes neglectus chaenodactylus* from North Sylamore Creek in north-central Arkansas. Mean minimum size for adults was found to be 13.5 mm cephalothorax length for males and females. Of 752 marked individuals, 228 were recaptured at least once. Females molted approximately two weeks after juveniles had left their abdomen, and at least two or three additional summer molts occurred prior to oviposition in the spring. Form I males molted to form II during April and May; form II individuals molted at least two times during summer months (form II to form II) before reverting to form I in late October and November. Projected age-size classes showed that during spring months, the majority of reproductive individuals in the population were two year olds; but during the fall, the subadult age-size predominated. Most individuals lived 2.5 years. Molting did not occur in overwintering adult crayfish.

(192)

Toxicity of Selected Heavy Metals at Varying Current Velocities to Mayfly Larvae, *Stenonema* spp.

RANDY M. PUCKETT AND ERIC L. MORGAN
Tennessee Technological University

Generally accepted methods employed in continuous flow macroinvertebrate toxicological tests have neglected the influence of current velocity on the intoxication process in test organisms. Current velocity has been shown to have profound effects on the respiration and metabolism of various aquatic organisms, including benthic invertebrates. An artificial stream system has been developed with the advantages of varying both current velocity and toxicant concentrations in what is termed a "dynamic flow" toxicological assay. Mortality observations for mayfly nymphs subjected to selected heavy metal treatments at various flow rates have been evaluated in 96 hour acute test regimes. Comparing preliminary test results to those obtained in conventional continuous flow toxicological assays employing the same heavy metals, our assumption of increasing toxicity with "dynamic flow" metal treatments is supported. Supported by US-TVA and the Aquatic Ecology Fund, Environmental Biology Research Program, Tennessee Technological University.

(193)

The Chromosomes of *Schistosomium douthitti* (Trematoda) and its Snail Host, *Lymnaea catascopium*

HENRY S. PUENTE, R. B. SHORT AND A. I. GROSSMAN
Florida State University

The karyotype of *Schistosomium douthitti* was described by Short and Menzel (1960, *J. Parasitol.*, 46: 273-287) from acetocarmine squashes. A restudy was conducted by means of colchicine treated, air dried, cell suspensions of material from sporocysts. Differences from the original description were noted in the centromeric positions of certain chromosomes. The present results show that the karyotype consists of 7 chromosome pairs ($2n = 14$), with a heteromorphic pair which is believed, from earlier work, to be in the female. Heterochromatin distribution was determined by C-banding. In addition, the karyotype of the snail host, *Lymnaea catascopium*, was determined from mitotic metaphases ($2n = 36$), and the haploid number of 18 was confirmed by meiotic chromosomes.

(194)

Basic Field Training for the Plant Systematist

ALBERT E. RADFORD
University of North Carolina

The development of sound classification (ecological diversity, natural heritage inventory, rare species, criteria for determination of significance) and information systems (e.g., ecological characterization, diversity summary, species general information, population status inventory, documentation system) is a requirement for

basic field training in plant systematics. The use and application of these systems in diversity and habitat inventory and analysis is intended to make floristic studies more sophisticated and scientifically valuable, monographic and revisionary studies more effectively documented, biosystematics and evolutionary research more soundly based and ecological diversity analyses and syntheses as related to systematics more meaningful and definitive. The information and data obtained from the literature search, from field observations and from limited analyses while using these systems provides a fundamental background for working out analytical procedures and experimental design for advanced research on the more challenging aspects of field-based problems. Applications and uses of the system will be illustrated.

(195)

Sampling Rare Fishes in the Cahaba River, Alabama

JOHN S. RAMSEY, WERNER WIELAND,
RICHARD K. WALLACE AND TOM J. TIMMONS
Auburn University

Unique and rare fishes of the upper Cahaba River main channel were sought in 82 samples designed to test a variety of large-river techniques. Traps of wire mesh, colorless plastic and fyke-like construction proved worthless in taking rare minnows and darters, as did night-light and electrofishing attempts. Night use of 4 m seines was the most rewarding technique generally, followed by daytime seining and bag-seining. A year of effort yielded specimens representing 76 species in the main channel out of the 129 kinds of fishes known from the entire Cahaba basin. *Notropis caeruleus* was conspicuous by its absence in samples and may have been extirpated since 1971, the time of its last known capture. Populations of other environmentally sensitive snail species seemed unchanged as of summer 1979, including *Notropis* sp. (cf. *volucellus*), *Noturus munitus*, *Ammocrypta asprella*, *Percina* sp. (cf. *copelandi*), *P. aurolineata* and *P. lenticula*.

(196)

The Distribution and Ecology of *Sarracenia rubra* Walt. ssp. *jonesii* (Wherry) Wherry (*Sarraceniaceae*) in South Carolina

DOUGLAS A. RAYNER
S. C. Wildlife and Marine Resources Department

Sarracenia rubra Walt. ssp. *jonesii* (Wherry) Wherry, mountain sweet pitcher plant, is endemic to the mountains of South and North Carolina and was recommended for nationally endangered status in Ayensu and DeFilippis (1978).

This species is restricted to parts of four small streams within about 2000 acres in Greenville County. The Pickens County collection reported in Radford et al. (1968) and McDaniel (1971) is erroneous.

Mountain sweet pitcher plant is found at elevations between 1200 and 1600 ft in open seepage bogs along small streams. Appropriate habitat is best developed where streams slide (not fall) over one margin of a rock outcrop which has a nearly level horizontal component and a slope of 5-20 degrees. This is an ideal bog habitat; light and moisture are abundant and plant succession is slowed dramatically because: 1) the bog is

over rock, and 2) continuous seepage inhibits soil formation. Although several other rare bog species are found here, only *S. rubra* ssp. *jonesii* is found only in these "ideal" bog habitats.

(197)

The Carolina Plants of Thomas Walter

DAVID H. REMBERT, JR.
University of South Carolina

Thomas Walter was born in Hampshire in England circa 1740 and arrived in South Carolina shortly before 1769. After occupying himself for a time as a merchant in Charleston, he moved into the parishes and began life as a planter. It was during this period that he began collecting and describing plants but never venturing more than 50 miles from home. By 1786 Walter had described about 640 plants and in the fall of that year was visited by the plant collector, John Fraser. It was the collections of Fraser that expanded the material that Walter had available for description. Fraser brought over 400 plants to Walter in 1787 and, in the winter of 1788, Fraser took the plants of Thomas Walter along with Walter's manuscript to London for publication. This manuscript, containing the descriptions of over 1000 species, was published in July, 1788, at the expense of John Fraser. The 263 page volume was entitled *Flora Caroliniana*. Walter died 6 months later in January, 1789. Most of Walter's collection is today bound in a large volume and housed in the Department of Botany of The British Museum in London.

(198)

Preliminary Study of Radio Transmittance for Remote Biosensing of Fish Respiratory Data

DENNIS J. RENFRO AND ERIC L. MORGAN
Tennessee Technological University

NORMAN D. MCCOLLOUGH, JR.
Advanced Technology Corporation

KENNETH W. EAGLESON
North Carolina Department of Natural Resources

Rapid detection of biological water quality conditions for many toxicology assessments may be crucial to decision making processes. Radio transmittance and retrieval of automated biosensing information would provide an easy and accurate means of monitoring aquatic systems. To meet this need, a portable microprocessor-controlled biosensor designed to collect fish respiratory data and physical water quality parameters is interfaced to a radio transmitter for transmittal to a land based receiver and data processor. The radio transmitter consists of a low voltage battery-powered unit providing a 1 m band transmission. Microprocessors are used in conjunction with the receiver for storage and analysis of the biological and physical data provided by remote stations. Initial designs, testing and data manipulation provide insight into possible applications of portable real-time fish biomonitors. Supported by U.S.D.I., O.R.W.T., and the Aquatic Ecology Fund, Environmental Biology Research Program, Tennessee Technological University.

(199)

Vacuole Ontogeny — Its Relationship to Embryo Sac Types (*Polygonum*, Etc.) and Apomixis

JOHN D. REYNOLDS

Virginia Commonwealth University

During normal and apomictic embryo sac formation, the time of vacuolar appearance, increase in vacuolar size and vacuolar position influence nuclear positions during pre/post-meiotic-mitotic divisions. In normal embryo sac formation vacuolar ontogeny plays a most important role in the type of embryo sac that is formed. Embryo sac type is determined by time of vacuolar formation as related to enlargement of the cell giving rise to the embryo sac and vacuolar positioning of nuclei and time of nuclear division in this cell. Little information is available as to what determines/controls vacuolar ontogeny other than the inherent genetic constitution of the plant. During the normal life of the plant, temperature, water and nutrient availability interact with the genetic makeup of the plant and thus contribute to its development. Vacuolar ontogeny is directly related to the various types of apomictic development. Examples will be drawn from haploid parthenogenesis, haploid apogamy, generative and somatic apospory and adventive embryony. Certain patterns of vacuolar/cytoplasmic/nuclear interactions have been noted and will be presented.

(200)

Vegetation of the Atlantic Coastal Ridge of Palm Beach County, Florida

DONALD RICHARDSON

University of South Florida

Predrainage vegetational patterns of the Atlantic Coastal Ridge of Palm Beach County were mapped using 1845-1870 aerial photographs, 1913-1973 soil surveys and ground truth studies. A detailed analysis of the vegetational changes regarding secondary succession was made by examining specific areas throughout the overall study region. These areas were described by documenting community changes with regard to species composition and location. Using the entire coastal strip vegetation maps and specific study sites, generalizations were made regarding plant succession in the major plant communities. Pre- and post-drainage historical and hydrological information was correlated with geological history in order to show how the physical and biological factors affect vegetation.

(201)

Sediment Accumulation in Aquatic Habitats Along the Upper Mississippi River

JERRY C. RITCHIE, J. ROGER MCHENRY AND CHARLES M. COOPER

SEA-AR, Beltsville, Maryland and U.S. Sedimentation Laboratory, Oxford, Mississippi

During the 1930's, a series of twenty-six locks and dams was constructed along the Mississippi River to

provide navigation between St. Louis and Minneapolis. The lakes formed these locks and dams also provided a new aquatic habitat. In recent years, concern has been expressed over the loss of this aquatic habitat from depositing sediments. Studies made on the Mississippi River between Minneapolis and Guttenburg, Iowa, found sediments accumulating at rates as great as 5 cm/yr in these backwater lakes. Sediment surveys in pools 8 and 9 found sediment accumulation rates to average between 0.5 and 1.0 cm/yr. Since the average depth in these pools is less than 2 m, these sediment accumulation rates could significantly alter the character of these manmade aquatic habitats in a few years, thereby changing their recreational, commercial and wildlife potential.

(202)

Color Discrimination by Bees through a Range of Natural Light Levels

R. D. ROSE AND R. MENZEL

Freie Universität Berlin

The honey bee (*Apis mellifera*) has a trichromatic color vision system. UV, blue and green photoreceptors respond maximally to wavelengths of 340, 440 and 530 nm, respectively. The ability of bees to learn and discriminate colors has been well characterized. This study examines color discriminatory ability of bees through a range of natural light intensities. Freely-flying bees were trained to color cards at both a feeding station and a hive entrance. Performance was measured at several different luminances using a behavioral choice test. Choice behavior was used as an index to calculate perceived stimulus difference. In all cases color discrimination increased as incident light decreased so long as the bees continued to fly. The feeding station apparatus was then placed at the end of a partially darkened flight tunnel to test behavior at still lower light levels. At incident light levels of 10-100 cd/m², performance peaks and begins its decline to random choice behavior (i.e., zero perceived stimulus difference) at 0.01 cd/m². Induced contrast did not affect the results.

(203)

A Photoactive Flavoprotein from *Protosiphon botryoides* Klebs

JAMES W. ROSS, J. C. O'KELLEY AND J. K. HARDMAN

University of Alabama

Plastocyanin and a flavoprotein in the green alga, *Protosiphon*, are believed to interact *in vivo* to control zoosporogenesis (cell division) by a photoreversible interaction. The organism contains several flavoproteins. The principal photoactive flavoprotein is being isolated and characterized. Preliminary studies indicate that it contains flavin mononucleotide (FMN) and has a molecular weight of approximately 150,000 daltons. Presently the photobiological properties are being studied.

(204)

Utilization of the Bay River System, North Carolina as a Fish and Invertebrate Nursery Area

STEVE W. ROSS

North Carolina Division of Marine Fisheries

Monthly trawling from March-November, 1979, was accomplished in 11 stations of the Bay River system and indicated that the shallow, low-salinity creeks were important developing areas for the postlarvae and juveniles of many fishes and invertebrates. Peak recruitment of postlarvae of the most abundant species, *Leiostomus xanthurus* and *Micropogonias undulatus*, occurred in the creek headwaters in April, and by September the majority had moved to deeper, more open waters. Other important seasonal users of the area were *Brevoortia tyrannus*, *Paralichthys lethostigma*, *Penaeus aztecus* and *Calinectes sapidus*. Some species such as *Anchoa mitchilli*, *Gobiosoma boscii*, *Microgobius thalassinus* and *Trinectes maculatus* may be permanent residents. In general these nursery areas were characterized by low species diversity and high seasonal production.

(205)

Distribution and Composition of the North Carolina Reef Ichthyofauna

STEVE W. ROSS AND R. O. PARKER, JR.

North Carolina Division of Marine Fisheries and
National Marine Fisheries Service,
Southeastern Fisheries Center

Since 1975, SCUBA observations and collections by trap, anesthetic, ichthyocide, gill net, hook and line and spear have been made on reefs from the intertidal to 33.5 m. These observations were supplemented by and compared to "live bottom" trawl samples (20-62 m) and submersible observations (27.5-153 m). Reef ichthyofauna shallower than 33.5 m was characterized by seasonal changes in biomass and species numbers. Maximum species diversity was observed on reefs with the highest profile in the depth range between 30.5 and 91.5 m, and the fauna in this depth range was dominated by tropical species. Many tropical species previously thought to be rare in this region were apparently abundant.

(206)

Life History and Ecology of *Ptilostomis postica* (Walker) in Greenbottom Swamp, Cabell County, West Virginia (Insecta: Trichoptera)

MARY BETH ROUSH AND DONALD C. TARTER
Marshall University

The life history and ecology of *Ptilostomis postica* (Walker) from Greenbottom Swamp in Cabell County, West Virginia, were investigated from December, 1977, to December, 1978. Length-frequency histograms indicate the life cycle is univoltine. Larvae achieved their greatest growth rate (75%) from fall to winter. Case

length showed its greatest increase (70.3%) for this same period. There was high correlation between case length and body length in fall ($r = 0.72$) and winter ($r = 0.87$), however, a low correlation ($r = 0.18$) was found in spring. The diet of the larvae changed from carnivorous in fall and winter to omnivorous in spring. Pupation began at the end of April and lasted approximately three weeks. Adult emergence began on 12 May, peaked on 20 May and lasted two weeks. Chi-square tests for pupae and adults showed no deviation from a 1:1 sex ratio at the 0.05 level. Adults are nocturnal and live less than one month.

(207)

Three Species of Sooty Molds on *Ligustrum vulgaris*

DON A. SAMUELSON
University of Florida

Three members, *Leptoxylum axillatum*, *Conidiocarpus* sp. and *Microxylum artocarpi*, of the form family Asboliscaceae grew harmoniously mixed together around and in sunken trichomes that were arranged along the abaxial midrib of older leaves of *Ligustrum vulgaris*. Early development of sporocarps is identical in all species, being simple meristogenous. Towards maturity, the sporogenous zone, which is typically stalked, is developed at a specific locality within the sporocarp for each species. In the three species the sporogenous zone is encapsulated by a solid fringe of sterile cells which form an ostiole. Historically the lengths of the stalk and the ostiolated region, referred to as the neck, have characterized the form genera in conjunction with conidial morphology. The present study demonstrated that spore, stalk and neck morphology is too variable within each species to be reliable for generic delimitation. Furthermore, the internal arrangement of the sporogenous zone differs little from one species to another. Consequently, the present evidence indicates that *Leptoxylum*, *Conidiocarpus* and *Microxylum* should be reclassified as subsections of a single redefined genus.

(208)

Plant Communities of the Obed National Wild and Scenic River, Cumberland and Morgan Counties, Tennessee

PAUL A. SCHMALZER AND H. R. DESELM
University of Tennessee

The Obed River and its tributaries, Clear Creek and Daddys' Creek, have cut steep gorges into the Pennsylvanian sandstones and shales of the Cumberland Plateau of Tennessee. The vegetation of these gorges has been sampled by 162 0.04 ha circular plots. Major community types have been identified by agglomerative cluster analysis. Forest communities dominated by chestnut oak, white oak, beech, tulip poplar, white pine, hemlock and river birch occur. A unique mixed shrub-herb community occurs on some frequently flooded sand bar and floodplain areas. Reciprocal averaging ordination was used to examine tree species distributions. Slope position, aspect and topographic form of the gorge appear to be important variables influencing species and community distributions.

(209)

Consequences of Natural and Artificial Incubation of Sea Turtle Eggs Lain in North Carolina

FRANK J. SCHWARTZ

Institute of Marine Sciences, University of North Carolina

CHARLES PETERSON AND HUGH PASSINGHAM

U.S. Marine Corps Base, Camp Lejeune

Loggerhead sea turtles nest in North Carolina from late May-late August. Eggs incubated under controlled (28-32 °C) temperatures, light and photoperiods confirmed Yntema and Mrosovsky's 1979 sex-temperature findings. However, percent hatch, present survival and hatching interval, in relation to month of egg laying, may be influenced by other facts. Fourteen artificially incubated nests yielded male and female turtles, temperature dependent. The mean present hatch of incubated eggs decreased from 77.6%, if eggs were originally lain in June, 73.4% July, to 42.4% August. Control nests (9) lain in August yielded a 33.3% hatch. Mean hatching intervals were: incubated eggs, 84 days June, 70 July, 58 August; controls 83. Minimum and maximum hatching days varied 48-90 (incubated), 79-98 (control). Thus, if left in field, more males would be produced during the longer cooler incubation periods of June and August, whereas females would dominate July egg clutch hatches. To increase survival, we recommend removal and incubation of all eggs lain after July.

(210)

Distribution and Abundance of Dryopoid Beetles in Brumley Creek and the North Fork Holston River, Virginia (Dryopidae: Coleoptera)

HENRY H. SEAGLE, JR. AND ALBERT C. HENDRICKS

Virginia Polytechnic Institute and State University

Dryopoid beetles form an important component of the lotic community on the basis of abundance, species diversity and their role in the benthic community. A survey of these beetles in the North Fork Holston River (NFHR) and its tributary, Brumley Creek (BC), was conducted from June, 1978, to April, 1979. Quarterly samples were taken at nine stations (six in BC and three in NFHR) with a Portable Invertebrate Box Sampler (0.1 m²). The 105 samples produced 12 dryopoid species that numerically comprised 25% of the benthic community. Longitudinal zonation was noted in individual species distributions as well as by increasing density and percent of the community downstream. Beetles were most abundant in September and December with density ranging from 0 to 5525, averaging 916/m². The most abundant species, *Stenelmis crenata* and *Optioservus trivittatus*, were distributed throughout the study area but were most prevalent in NFHR. *Dubirapha* sp. and *Psephenus hericki* were concentrated in NFHR and lower BC, while *Oulimnius latiusculus* and *Promorcsia tardella* occurred almost exclusively in BC. The remaining species were sparsely collected.

(211)

Density-Dependent Aspects of Growth and Metamorphosis in Tadpoles of *Scaphiopus holbrooki*

RAYMOND D. SEMLITSCH AND JANALEE P. CALDWELL

Savannah River Ecology Laboratory

Density-dependent aspects of growth and metamorphosis of *Scaphiopus holbrooki* tadpoles were examined under constant laboratory conditions and several density treatments. Growth rates of tadpoles decreased inversely with density; $\bar{X} = 0.023$ ml/day at 3 tadpoles/container to $\bar{X} = 0.006$ ml/day at 30 tadpoles/container. The number of days to metamorphic climax was positively associated with the initial density treatment; $\bar{X} = 27$ days at the lowest density to $\bar{X} = 86$ days at the highest density. The body size of tadpoles at metamorphosis showed a curvilinear relationship to initial density. The survival of tadpoles decreased significantly with initial density from 90% at the lowest density to 20% at the highest initial density.

(212)

Intraspecific Variation in the Anthiine, *Holanthias martinicensis* (Pisces: Serranidae)

FELICIA C. SEYFERT

Grice Marine Biological Laboratory

Members of the currently recognized genus *Holanthias* are distinguished by their buccal dentition and the shape of the caudal fin. There is, however, wide variation inter- and intra-specifically in both of these characters; thus the validity of the genus *Holanthias* is questionable. Character variation in *H. martinicensis* (Guichenot) is examined using meristic and morphometric data. This species is compared with other species of *Holanthias* and with other anthiine fishes. It is proposed that *H. martinicensis* be placed in the genus *Anthias*.

(213)

Phosphodiesterase and Cyclic AMP Dependent Protein Kinase in the Hemocytes of the American Cockroach

SHANNON C. SHAFER AND RICHARD R. MILLS

Virginia Commonwealth University

Molecular sieve chromatography of soluble hemocyte proteins separates the cyclic AMP binding components from the smaller compounds. Prior incubation of the soluble hemocyte proteins with ³H-cAMP results in the label being bound to proteins with a molecular weight greater than 40,000 daltons. The addition of isobutylmethylxanthine markedly lowers the amount of bound label suggesting that most of the cAMP binding protein is phosphodiesterase.

Polyacrylamide gel electrophoresis of the soluble hemocyte proteins shows a number of bands. Tritiated cAMP incubation causes the binding of the label to

more than one protein band. Subsequent experiments using isobutylmethylxanthine eliminates labeling in one component and denotes which bands are phosphodiesterase and protein kinase. The enzyme has been subjected to polyacrylamide electrophoresis with and without SDS. Banding patterns of the intact enzyme and its subunits have been tentatively identified.

(214)

Isozyme Variation in *Typha latifolia* (Typhaceae) in North America

REBECCA R. SHARITZ

Savannah River Ecology Laboratory

Numerous studies have explored the development of ecological races integrated by natural selection with the local climate in plant species occurring across geographic, altitudinal or other environmental gradients. Populations of broad-leaved cattail (*Typha latifolia*) have been shown to demonstrate differences in morphological, physiological and biochemical properties which are maintained in transplant gardens under exposure to the same conditions. The potential genetic basis for this ecotypic differentiation was explored in an extensive survey of the electrophoretic patterns in *T. latifolia* populations from across a broad geographic range in North America. However, analysis of ten enzyme systems in samples from more than 300 cattail stands revealed an extremely low level of isozyme variation and heterozygosity. The seeming inconsistency of these results and hypotheses regarding the extent and nature of variability in this species will be discussed.

(215)

Treatment of Dense Ovule Walls with Monoethanolamine Used in Conjunction with Clearing Technique

HARRY E. SHEALY, JR.

University of South Carolina, Aiken

Monoethanolamine is useful in removing a dense layer in the outer ovule walls of certain xerophytes endemic to granite outcrops. Ovules of *Sedum pusillum* Michx., *Sedum smallii* (Britton) Ahles and *Arenaria uniflora* (Walter) Muhl. have a dense outer layer which impairs the use of the Herr "4½" clearing technique. However, when the ovules fixed in FPA₃₀ or Randolph's modified Navashin and stored in 70% ethanol are pretreated with monoethanolamine and refined, the Herr "4½" clearing technique works well. The following procedure is employed. Ovules stored in 70% ethanol are transferred to 95% ethanol, then to 100% ethanol. The ovules are further transferred through a graded series (3:1, 2:2, 1:3) of 100% ethanol/monoethanolamine to pure monoethanolamine. Ovules remain in each solution for approximately 15 minutes before transfer. Ovules in the pure monoethanolamine are heated in an oven or heating block to 97°C for 25 to 30 minutes. The ovules are returned through the same graded series to 70% ethanol. From 70% ethanol, the ovules are refixed by transferring them to FPA₃₀ or Randolph's modified Navashin for 12 to 24 hours. Once refixed, the ovules can be stored in 70% ethanol until ready to clear by the Herr "4½" clearing technique.

(216)

Age, Growth and Food Habits of the Windowpane Flounder, *Scophthalmus aquosus* (Pisces:Bothidae), in the Lower Cape Fear River Estuary and Adjacent Ocean

SCOTT T. SHELTON AND FRANK J. SCHWARTZ

Institute of Marine Sciences, University of North Carolina

The age, growth and food habits were examined for windowpane flounder, *Scophthalmus aquosus*, captured January through November, 1976, in the lower 35 km of the Cape Fear River and adjacent ocean. *Neomysis americanus* was the dominant food eaten (71.4% frequency). Other important foods were copepods, amphipods and fishes. The literature suggested a split spawning period starting in April and the fall for windowpane flounder in North Carolina waters. Cape Fear material, based on individuals < 30 mm SL captured in late winter (February) and early spring (March), indicated a late fall or early winter spawning. Scales were examined to determine age and growth. Young-of-the-year (age class 0) fish dominated the catches. Successive aged fish were: 1 yr old, 91-121 mm SL (mean 96.7); 2 yr old, 111-147 mm (110.3); and 3 yr old, 131-153 mm (150.1). The length-weight relationship was $W = 0.578 \times 10^{-4}(L)^{2.82}$ or $\log W = -4.60 + 2.82 (\log L)$.

(217)

Germination and Seedling Growth of Baldcypress

C. SHERROD, JR. AND K. W. MCLEOD

Savannah River Ecology Laboratory

Harvesting timber from swamp forests of the southeastern United States continues. Dominant species of these forests are water tupelo (*Nyssa aquatica*) and baldcypress (*Taxodium distichum*). Reforestation is generally left to natural regeneration methods such as stump sprouting. Water tupelo is extremely capable of reproducing itself in this manner but baldcypress is not. Therefore it is especially important to examine the means by which baldcypress can establish itself and how various environmental factors might alter its success. Effects of soil-water content and the temperature on the germination and growth have been examined for the past 3 years. Soil water effects appear minimal. Slight temperature increases cause reduced survival of first year seedlings but enhance growth thereafter. Effects of these environmental variables on the germination, growth rates, productivity and survival will be discussed in detail.

(218)

A Fossil Flora from the Holocene of Macon County, Alabama

DONNA L. SHIPP

George Mason University

Holocene clays along Uphapee Creek were sampled for macroflora and pollen analyses on a U.S. Geological Survey sponsored field trip. The macroflora data now available, with radiocarbon dating (U.S. Geological Survey Radiocarbon-14, Reston, Va.) indicate ages between 6360 ± 110 y.B.P. and 7520 ± 110 y.B.P. Leaves,

fruits and seeds have been isolated. Leaves were prepared by clearing and examined through light, scanning electron and transmission electron microscopy. All materials were identified and quantified to determine genera present and the relative abundance at that time. Common genera were *Quercus*, *Pinus*, *Betula* and *Acer*, similar to the genera present in the flora today, but the relative abundance of each shows some change.

(219)

Karyotypes of Two Closely Related Blood Flukes: *Schistosoma mansoni* and *S. rodhaini* (Trematoda)

ROBERT B. SHORT AND ABRAHAM I. GROSSMAN
Florida State University

Schistosoma mansoni and *S. rodhaini* are two species in the African *S. mansoni* complex which is characterized by lateral-spined eggs. *S. mansoni* is primarily a parasite of man, whereas *S. rodhaini* is primarily a parasite of wild rodents. Except for egg shape the morphology of these species is very similar. Karyotypes of these species are also generally similar. The diploid number of both species consists of eight chromosome pairs; two large pairs of about equal length, three medium-sized, and three small pairs. The large and medium-sized chromosomes have subterminal centromeres; the smaller ones are metacentric or submetacentric. One of the large pairs are the sex chromosomes. Certain notable differences between the karyotypes of these two species were detected in chromosome morphology and constitutive heterochromatin composition. We propose that these observed karyotype differences could be used to distinguish these two species in the field.

(220)

Selenium and Vitamin E: A Possible Role in the Prevention of Myocardial Infarction

DUANE B. SHROYER AND NATHANIEL REVIS
*Millsaps College and
Oak Ridge National Lab*

The cell has several systems to stop the oxidative breakdown of tissues based on selenium and vitamin E. Selenium participates in these systems as a necessary component of the enzyme, glutathione peroxidase, which reduces hydrogen peroxide to water. Vitamin E stabilizes membranes possibly through the inhibition of the formation of lipid hydroperoxides from membrane fatty acids. A study was conducted using selenium and vitamin E to determine their effects on tissue destruction during myocardial infarction. This study concluded that increases in selenium concentration (through drinking water) above 1.0 ppm significantly reduces the damage to the heart after IPR induced myocardial infarction. It was also shown that the addition of vitamin E to the diet already supplemented with selenium would lead to additional protection. Another result was that IPR somehow inhibited the action of glutathione peroxidase 6 hours postinjection, possibly through the release of selenium from the cell.

(221)

Hollow Spheres Associated with Nucleoli in Meiotic Cells

J. KENNETH SHULL
Loyola University

Electron dense structures appearing as hollow spheres have been found in the meiotic nuclei of *Lilium longiflorum* var. 'Croft' and in two interspecific hybrids of *Lilium*. Similar spheres have previously been reported in several other plants. The spheres appear to emerge from the nucleolus in zygotene and at that time do not appear to be associated with similar objects. By pachytene the spheres most often appear in groups of twos and threes, and it is possible that many are in groups of fours associated as tetrahedra. In the electron microscope the spheres appear to be more dense than either chromosomes or nucleoli. Preliminary evidence suggests that they are not composed of DNA. The outside diameter of the hollow spheres ranges from 0.41 to 0.9 μ , and the hollow space has a diameter of 0.3 to 0.5 μ .

(222)

Litter Decomposition Dynamics in a South Carolina Floodplain Forest

DONALD J. SHURE, MARLIN R. GOTTSCHALK AND
KEITH A. PARSONS
Emory University

Litter decomposition rates and elemental fluxes were determined in litter-bag studies in a floodplain forest in South Carolina. Bags containing mixed leaf species were set up across the floodplain and within the adjacent upland terrace. Annual decomposition varied from 55% to 75% and was highly dependent upon the extent of flooding at different locations. The decomposition rates of individual leaf species were compared in a second year's study. Sweetgum leaves decomposed more slowly than red maple, blackgum and carolina ash, respectively. Decomposition was slower during the second year which was drier and experienced less flooding. Cation (Mg, K, Ca) and anion (N) concentrations of decomposing litter were followed during both studies. Elemental changes during decomposition generally varied for each leaf species and often reflected flooding intensities across the floodplain habitat.

(223)

A Study of the Cretaceous Fern, *Osmunda sphenopteroides* Fontaine

JUDITH E. SKOG
George Mason University

Some fossil foliage recently collected from the Lower Cretaceous (Potomac Group) in Maryland was shown to belong to the family Schizaeaceae on the basis of the spores isolated from the attached sporangia. However, on the basis of a description of foliage and comparison with type material in the U.S. National Museum of Natural History the newly collected material was identified as *Osmunda sphenopteroides* Fontaine. To solve this problem the fertile type material was prepared for

light and scanning electron microscopy. The type material also possesses attached spores belonging to the dispersed spore genus *Cicatricosisporites* which is generally accepted as belonging to the family Schizaeaceae. Further comparison of the foliage and spores shows all the Potomac Group material, including *Osmunda sphenopteroides* of Fontaine, to compare most closely to *Ruffordia goepperti* (Dunk.) Seward from the Wealden Age of England. Thus, the material from the Potomac Group belongs in the family Schizaeaceae.

(224)

An Introduction to the Taxonomic Revision of *Piptocarpha* R. Br. (Compositae: Vernoniaceae)

GERALD L. SMITH
University of Georgia

Piptocarpha is a widespread neotropical genus of the tribe Vernoniaceae with a distribution in Central America, South America and the West Indies. Consisting of approximately 50 species, it is one of the largest genera in the tribe. A survey of the literature and an examination of herbarium specimens received through loans indicate that *Piptocarpha* is taxonomically confused and in need of revision. A preliminary investigation of two Peruvian species of *Piptocarpha* has demonstrated that a revisionary-biosystematic approach, integrating information from field and morphological studies, crossing experiments, cytology, pollen morphology and natural products chemistry is necessary for a thorough and accurate revision of the genus.

(225)

Temperature Preference of Laboratory Reared Larval Silver Redhorse, *Moxostoma anisurum* (Rafinesque), and Larval Golden Redhorse, *Moxostoma erythrurum* (Rafinesque) (Cypriniformes: Catostomidae)

REINALD E. SMITH, JAY R. STAUFFER, JR. AND
CHARLES H. HOCUTT
Appalachian Environmental Laboratory

Temperature preference studies were performed on meso- and metalarval specimens of silver redhorse, *Moxostoma anisurum* (Rafinesque), and golden redhorse, *Moxostoma erythrurum* (Rafinesque). Larvae were obtained by means of incubation of field stripped and fertilized eggs from gravid individuals collected from Buffalo Creek, Monongahela drainage, West Virginia. Test temperatures examined included 6, 12, 18, 24 and 30 C; acclimation to 30 C was attempted but all larvae died between 34-35 C. Preferred temperatures of silver redhorse were 9.5, 16.9, 25.0, 25.3 and 24.9 C, respectively. Preferred temperatures of golden redhorse were 11.0, 11.9, 19.7, 25.8 and 27.4 C, respectively.

(226)

Growth of Male Mollies, *Poecilia latipinna*

FRANKLIN F. SNELSEN, JR.
University of Central Florida

Since the work of Turner in the 1940's, it has been a generally accepted tenet that males of livebearing fishes

(Poeciliidae) cease growth after attaining sexual maturity whereas females continue to grow throughout life. Surprisingly, the only empirical data in the literature reveal that mature male platyfish do not cease growth.

I studied growth of male and female sailfin mollies (*Poecilia latipinna*) under controlled laboratory conditions. The two sexes grew at approximately equal rates during the first 35-55 days following birth, before either sex reached maturity. Male growth slowed but continued after maturity. Two experimental groups of mature males, small "sneaky-males" and large "super-males," grew only 1/4-1/2 as fast as mature females fed on identical rations. Despite the capacity for slow but continued growth, it seems unlikely that sneaky-males ever grow to become super-males in natural populations. In fact, under field conditions males may not grow after maturing. The origin and significance of super-males remains unclear.

(227)

The Distribution of the Vascular Flora in Plant Communities at Lilley Cornett Woods, Appalachian Ecological Research Station, Letcher County, Kentucky

J. SOLE, S. LASSETTER AND W. H. MARTIN
Eastern Kentucky University

Lilley Cornett Woods is centrally located in the Mixed Mesophytic Forest Region and lies in the "rugged eastern area" of the Cumberland Plateau. The research station is approximately 220 ha in area and contains 104 ha of virgin upland forest. The several plant communities recognized reflect the diverse habitats and land use history of the woods. Collection routes for this floristic study were established and maintained in old growth and successional forests and in old fields during two growing seasons. In addition to documenting the flora, the distribution of taxa by plant communities was determined. Floristic richness is highest in successional forests and old fields. In old growth communities, the beech and oak communities are similar in richness. The flora is typical of plateau forests and fields. Comparisons with other vegetation types in the Southern Appalachians will be made. Plants rare in Lilley Woods and those significant to the Kentucky flora will also be discussed.

(228)

The Effect of Strigol and Strigol Analogs on *Orobancha minor* (Orobanchaceae) Germination

DAVID L. SPELCE
Old Dominion University

Orobancha minor Smith is an introduced root parasite that is known to attack some commercial crops. Like other members of the genus, it will germinate only after a preconditioning period involving moisture which must be followed by a chemical stimulant produced by the host root. Recent work has shown that strigol and

strigol analogs will cause germination in some species of *Orobanchae*, although its effect on *O. minor* has not been tested. Six replicates of ten different concentrations of strigol and strigol analogs (GR compounds) were applied to preconditioned *O. minor* seeds. Statistical tests indicate a significant difference between the effectiveness of these compounds ($p = .001$). Strigol gave the highest percentage of germination followed by GR-45 and GR-7 with higher germination rates at increased concentrations.

(229)

Some Ecological Observations on Highlands Hammock State Park, Florida

RICHARD STALTER
St. John's University

STEVE DIAL
Pfeiffer College

Highlands Hammock State Park, Highlands County, Florida, is a virgin hammock that has never been cut for timber. Arborescent vegetation was sampled by means of the quadrat method during the late spring of 1979. Twenty-five 10×10 m quadrats were established in two areas of the park: the "Big Oak Trail" and the "Hickory Trail." Relative dominance values and importance values for arborescent species were calculated in each area and compared. *Quercus virginiana* was dominant in the Big Oak Trail while *Sabal palmetto* was codominant. *Sabal palmetto* was dominant on the Hickory Trail with *Q. virginiana* the codominant species. *Carya glabra*, while represented by several large trees, was fourth in relative dominance and importance value on the Hickory Trail. Highlands Hammock experiences temperature as low as 20 F every 40 years. Infrequent but severe cold probably accounts for the dominance of the aforementioned subtropical species.

(230)

Estival Abundance, Distribution and Ecological Segregation of Culicoidea Larvae (Diptera) Within Benthic Communities of Small Southern Watershed Impoundment Ponds

GEORGE E. STANTON
Columbus College

MICHAEL W. HEYN
Murray State University

Ekman grab samples at half-meter intervals from 23 small ponds in west Georgia indicate that larvae of 3 culicoid families dominate benthic communities. Abundance and distribution data have been employed to test hypotheses regarding niche characteristics and segregation of encountered genera.

A total of 14,768 invertebrates were collected: 70% Diptera and 22% Chironomidae. Mean densities of Diptera significantly greater than zero were sampled at all test depths, but chironomid densities were significant only to two m deep.

From 12 of these ponds, 30 genera were encountered: 28 Chironomidae; one Chaoboridae and one Cerato-

pogonidae. Four chironomid subfamilies were represented, and *Chaoborus*, *Glyptotendipes*, *Chironomus*, *Procladius*, *Tanytarsus*, *Cryptochironomus*, *Clinotanypus* and *Polypedilum* predominated in both abundance and frequency. Low abundance was characteristic of 22 genera and 9 genera were found in only one or two ponds.

Littoral communities included about 97% of the genera, including most rare taxa; this proportion declined to 57% at 1 m, 21% and 2.5 m and only 4% below 4 m. Even more separation of genera was indicated when distributions of densities over depth were evaluated. Niche parameters may be physically mediated for species found below two meters deep, but environmental heterogeneity and biological mediation probably account for segregation within littoral and sublittoral communities.

(231)

Isolation of Compounds Eliciting Haustoria in *Agalinis purpurea* (Scrophulariaceae)

JOHN STEFFENS, DAVID LYNN AND JAMES L. RIOPEL
University of Virginia

Agalinis purpurea is being used to study host recognition resulting in haustorial initiation by parasitic higher plants. Gum tragacanth, a crude plant exudate, is a potent elicitor of haustoria in *Agalinis* and can substitute for host root exudate. Fractionation of a highly active ether extract of tragacanth is being carried out by droplet countercurrent, gel permeation and high pressure liquid chromatography. Results indicate that at least two low molecular weight compounds elicit the host recognition response from this hemiparasite.

(232)

Plant Communities of Abandoned Coal Surface Mines

ANNE S. STOCUM AND EDWARD E. C. CLEBSCH
University of Tennessee

The vegetation of eight abandoned coal surface mines and the surrounding undisturbed forest in the Cumberland Mountains of Tennessee was sampled and correlated with soil and site variables. The mines varied in age from 12 to 22 years since mining. Several relief points were sampled on each mine: the area adjacent to the highwall, the crest of the spoil bank and the mid-point of the outslope. Pine species are most common on the crest of the spoil bank and less common on the outslope. Hardwoods generally dominate the area adjacent to the highwall and the outslope, the most common species being *Acer rubrum* and *Liriodendron tulipifera*.

(233)

Habitat Complexity as a Mediator of Prey Selectivity by Pinfish (*Lagodon rhomboides*: Sparidae)

ALLAN W. STONER
Harbor Branch Institution, Inc.

Amphipod species consumed by *Lagodon rhomboides* represented a small subset of the amphipod assemblage

available at three seagrass sites in Apalachee Bay, Florida. Important prey species were all epifaunal forms. Consumption of preferred amphipod species was non-selective at a site with sparse macrophyte cover, but selectivity increased with macrophyte biomass. Laboratory experimentation showed that seagrass biomass regulated the number of prey taken by pinfish and confirmed the hypothesis that prey selectivity is a direct function of seagrass biomass. Variation in habitat structure over space and time may be an important influence on the organization of community structure in prey groups through alteration of predatory behavior.

(234)

Effects of Various Extracts on the Radicle Morphology of *Striga asiatica* (Scrophulariaceae) and Attachment to Non-hosts

CAROL D. STUART, R. E. EPLEE AND R. A. STEVENS
Old Dominion University and
Witchweed Methods Development Center, USDA

Extracts were made of corn, cotton and coleus roots using various solvents. Water extracts of the solvents induced swelling of epidermal cells and formation of root hairs on witchweed radicles. The seedlings with root hairs were placed on the roots of hosts and non-hosts to check for attachment and shoot development. The hosts and non-hosts were grown in soil in inverted cups of clear plastic to provide a view of the root system. The cup was lifted to expose the root system and the witchweed seedlings were pipetted directly onto the roots. Witchweed seedlings treated with gum tragacanth and kinetin also form root hairs and were placed on host roots. Attachment studies are still in progress. Coleus, formerly thought to be a non-host, was found to be attacked by witchweed. Strigol germinated witchweed seedlings attach to turnip, a non-host. No treatments have yet resulted in attachments to cotton although cotton roots produce strigol.

(235)

Flavonoids of Vernoniae (Compositae), Taxonomic Value

JOHN G. STUTTS
University of Georgia

Flavonoid reports in the *Vernoniae* have been largely confined to the genus *Vernonia*. Other genera which have received some detailed attention include *Centratherum*, *Corymbium*, *Elephantopus*, *Eremanthus*, *Ethulia*, *Haplophyllum*, *Stokesia* and *Vanillosmopsis*. This is a total of only nine in a tribe containing ca 50 genera. Recently, several flavonoids have been elucidated from various taxa in the genera *Pollalesta*, *Piptocomia*, *Piptocarpha* and *Lychnophora*. The identities of these compounds and the possibility of utilizing flavonoids as taxonomic characters at the intergeneric level in the tribe *Vernoniae* will be discussed.

(236)

A New Species of *Fundulus* from the Lake Pontchartrain Tributaries of Louisiana and Mississippi

ROYAL D. SUTTKUS AND ROBERT C. CASHNER
Tulane University and University of New Orleans

A new species of *Fundulus*, subgenus *Zygonectes*, is reported from the Tangipahoa and Amite rivers, tributaries to the Lake Pontchartrain estuary, in Louisiana and Mississippi. It is compared to its closest relatives, *F. notatus* and *F. olivaceus*, with which it occurs sympatrically. The new form resembles these members of *Zygonectes* in general aspects of color pattern, but differs strikingly in lateral band width, prepectoral pigment and life colors. Details of distribution and ecology of the three species of *Zygonectes* are also discussed.

(237)

Tidally Oriented Movements of the Atlantic Stingray, *Dasyatis sabina* (Pisces:Dasyatidae)

CHRISTOPHER M. TEAF
Florida State University

Although accounts of tidally oriented movements exist for many taxa of marine organisms, the extent and regularity of these migrations has seldom been quantified. The northeastern Gulf of Mexico population of *D. sabina* studied showed an extremely strong relationship between direction of movement and tidal flow direction in an open coastal and tidal creek environment. Being essentially structural hydrodynamic wings, stingrays and other dorsoventrally or laterally flattened forms can make extended movements along the bottom while expending little energy, if moving with a current such as a tidal flow.

(238)

Aspects of the Life History of *Menidia beryllina* (Cope) in Lake Pontchartrain and Surrounding Marshes, 1977-1978

BRUCE A. THOMPSON AND STEVEN J. LEVINE
Louisiana State University

In a baseline survey of the Lake Pontchartrain system, 6121 *M. beryllina* were collected with seines and dipnets from littoral and marsh habitats. Relative abundance, marsh/lake occurrence variation, seasonal variation, length frequency and food habits were analyzed. *M. beryllina* occurred in equal abundance during all four seasons and utilized the marsh as secondary habitat during phases of their life cycle. Overall abundance was greater than had been indicated in earlier Lake Pontchartrain surveys. Food analysis of 480 *M. beryllina* demonstrated predation upon small crustaceans (especially Amphipoda), insects and fishes. Supported by the U.S. Army Corps of Engineers, New Orleans District (Contract #DACW29-77-C-0253).

(239)

Fecundity and Spawning of Largemouth Bass in a Newly Impounded Reservoir, West Point Reservoir, Alabama-Georgia

TOM J. TIMMONS, W. L. SHELTON AND W. D. DAVIES
Auburn University

Fecundity of largemouth bass, *Micropterus salmoides*, in West Point Reservoir, Alabama-Georgia, was studied. The gonosomatic index for female fish and frequency distributions of ovum diameters were reliable indicators of the largemouth bass spawning season. Spawning began in mid-April and continued until early June. Some fish apparently spawned more than once. No late summer or fall spawning was indicated. Individual fecundity, determined by a dry weight method, ranged from 6,200 to 117,200 mature ova for bass over 300 mm TL. Bass less than 300 mm in total length contributed few of the eggs produced in 1977. Ova matured at a size larger than those described in other studies for largemouth bass. Regression equations were developed to describe the relationships of fecundity to length, weight and age with weight giving the best correlation: $Y = -1,908.36 + 30.81 X$. The rapid growing initial year class of largemouth bass dominated the reproducing population, and there was a low correlation between fecundity and age.

(240)

Stomatogastric Nervous System of the Adult Alfalfa Weevil, *Hyper postica* (Coleoptera:Curculionidae)

AVERETT S. TOMBES
George Mason University

Two lateral connectives extend ventrally from the base of the protocerebrum to form the frontal ganglion. A pair of suggestive neurosecretory cells are found among the neurons and glial cells which form an anterior cortex to the central neuropile. The recurrent nerve extends from the frontal ganglion along the dorsal surface of the stomadaeum. With the scanning electron microscope considerable detail has been observed concerning the association of the branch nerves with the alimentary canal. Fine structural analyses have been made of the neurons, axons and supportive tissue in reproductive and non-reproductive animals.

(241)

Observations on a Digenetic Trematode (Brachylaemidae) from the Eastern Mole, *Scalopus aquaticus*

HUGH M. TURNER AND STURGIS MCKEEVER
McNeese State University and Georgia Southern College

Specimens of the Eastern Mole, *Scalopus aquaticus*, trapped in the vicinity of Ridgeland, South Carolina, were found to be infected with digenetic trematodes of the genus *Ityogonimus*. Of seven moles examined, three harbored an average of 22 worms in their intestines.

(242)

Preliminary Report on Reproduction in the Exotic Poeciliid, *Belonesox belizanus*, from Dade County, Florida

JAMES S. TURNER
University of Central Florida

The pike killifish, *Belonesox belizanus*, is native to eastern Central America. It is the largest and one of the most unusual members of the live-bearing Poeciliidae. The species was introduced into southeastern Dade County, Florida, in 1957 and rapidly became established in that area. These fish are primarily piscivorous and have been identified as a possible "problem" for Florida due to their voracious appetites and apparent strong preference for *Gambusia* as a prey item.

Laboratory reared females gave birth to broods at ages ranging from 163-211 days. Males reached maturity at 80-95 days. Interbrood interval was ca 42 days at 26 C. Brood sizes of up to 265 have been found. Mature females ranged from 80-141 mm S.L. Mature males ranged from 38-68 mm S.L. The young are ca 14-15.5 mm S.L. and are able to eat neonate *Gambusia* soon after birth. Brood size was weakly but positively correlated with female size.

(243)

Trichomes as Taxonomic Tools in the Bromeliaceae

JOHN F. UTLEY
University of New Orleans

While the Bromeliaceae are not unique in possessing absorbing trichomes, the extent to which these structures have been exploited in adapting to the epiphytic habitat is unparalleled in the plant kingdom. These unique hairs have been implicated in absorption and retention of water and nutrients, as well as protection from potentially damaging levels of insolation. Despite an early recognition of variations in trichome structure there is no history of comparative studies within or among species. Recent investigations of the Costa Rican thecophylloid vrieseas have demonstrated distinctive but not invariable morphologies within species and frequently disparate morphologies among closely related taxa. While foliar trichomes will not be a taxonomic panacea they do represent a poorly utilized source of characters for this important family of neotropical epiphytes.

(244)

Distribution of Caulerpin and Caulerpacin in Eight Species of *Caulerpa* Lamouroux (Chlorophyceae) and Their Relation to Two Opisthobranch Molluscs

SUSAN VEST, J. ROMEO AND C. J. DAWES
University of South Florida

Eight Florida species of the green alga, *Caulerpa*, were analyzed by column and thin layer chromatography for presence or absence of caulerpin and caulerpacin. These compounds were previously known only from

Philippine *Caulerpa* species. Caulerpin was found in five species, caulerpicin in four. Three species contained both compounds. *Elysia cauze* Marcus selectively feeds upon three of the four *Caulerpa* species which contain caulerpicin, while *Oxynoe antillarum* Mörch is restricted to two of the four caulerpicin species. Tests were run to determine if these two opisthobranchs retain caulerpicin and pass it into their egg masses. The possible ecological role of caulerpicin as a feeding attractant and/or deterrent is discussed.

(245)

What is *Unionicola* (*Unionicolella*) *stricta* (Wolcott 1898) (Acarina)?

MALCOLM F. VIDRINE
University of Southwestern Louisiana

Unionicola stricta is a small, parasitic fresh-water mite found in the gills of the nominal unionid mussel genus, *Uniomorus*, from the Mississippi Interior Basin and the Gulf drainages from the Yellow River in Florida to the central Texas drainages. To date, it has been confused with several other species as a result of a mixing of the type specimens. A comparison of the types with the original description shows that *U. stricta* is unique in having simple claws on all walking legs and a complete suture between the third and fourth coxal plates. It also matches the description of the subgenus *Unionicolella* and not that of *Pentatax* in which it was originally placed. *U. stricta* apparently is morphologically close to *U. tupara* Mitchell and Wilson 1965 which infests the gills of the nominal mussel genera, *Amblema*, *Megaloniaias* and *Plectomorus*. Both *U. stricta* and *U. tupara* may exceed 100 individuals per host and both deposit their eggs in the ventral edge of the outer demibranchs of the hosts. These mites also closely resemble several undescribed species currently considered to be in the genus *Atacella*. The author acknowledges the use of *Unionicola* types from the Field Museum of Natural History, Chicago, and The Museum of Comparative Zoology, Harvard University.

(246)

Najadicolinae, an Ancient and Distinctive Clade?

MALCOLM F. VIDRINE AND MEREDITH H. LIEUX
University of Southwestern Louisiana and
Louisiana State University

Najadicola ingens (Koenike 1895), a large endobranchial fresh-water mite, parasitizes a broad spectrum of nominal fresh-water mussel genera in North America. These genera include: *Popenaia*s, *Uniomorus*, *Lampsilis*, *Anodonta*, *Elliptio*, *Carunculina*, *Tritogonia*, *Villosa*, *Quadrula*, *Fusconaia* and *Amblema*. In all life stages (larva, nymph and adult), the morphology of *N. ingens* is sufficiently distinctive to warrant its placement in the monotypic subfamily Najadicolinae. The validity of this subfamilial ranking is further evidenced by the unique reproductive biology of this mite. Also, *N. ingens* has recently been taken from *Trapezoides exolebens exolebens* Gould (Unionacea) from the Mekong River in Thailand, suggesting a cladogenetic event that antedated the breakup of Pangaea. In summary, our knowledge of the geographic range, host range, morphology and reproductive biology of *N. ingens* supports the contention

that this taxon represents an ancient clade within the Unionicolidae. The authors acknowledge the Jessup Furd of the Academy of Natural Sciences of Philadelphia, the Department of Biology and the Graduate Student Organization of the University of Southwestern Louisiana for their support. The use of mussel lots from the Academy of Natural Sciences of Philadelphia, the Ohio State University Museum and the Delaware Museum of Natural History is also acknowledged.

(247)

Geckos: A Complex Adaptive Strategy of Tail Autotomy

Laurie J. Vitt and Royce E. Ballinger
University of Georgia and University of Nebraska

The South American gecko, *Vanzonia klugei*, is not only adapted to use its tail for locomotion but also to use its tail for predator escape via autotomy. The tail tip is equipped with a scansorial pad similar to the scansorial pads found on the toes. Regeneration of lost tails is rapid, and the specialized scales of the scansorial pad are regenerated. Tail loss is expensive as tails contain 29% lipid (6.37 calories per mg), but this cost is apparently balanced by the benefits in terms of escape from predation.

(248)

Genetic Differentiation in the Gulf Coast Sunflower, *Helianthus debilis* (Asteraceae)

RICHARD P. WAIN
University of South Florida

Techniques of starch gel electrophoresis were employed to estimate levels of genetic differentiation among several subspecies of the Gulf Coast sunflower, *Helianthus debilis* L., from Florida and Texas. These subspecies represent the initial stages of the speciation process with the only major reproductive isolating barrier being allopatry. Genetic differentiation will be compared to cytological and morphological differentiation and possible phylogenetic relationships of the subspecies will be discussed.

(249)

Productivity and Ecology of *Hexagenia munda* (Ephemeroptera) in Piedmont Stream Margin Communities

William H. Walker, Jr.
Georgia Institute of Technology

Intergrade populations of *Hexagenia munda elegans* Traver and *H. m. marilandica* Traver were found during a thirteen-month study to dominate the monthly standing crops of macroinvertebrates in the stream margin communities of two unpolluted Georgia piedmont rivers. Mean annual *Hexagenia* standing crops in those rivers were 0.64 g/m² and 3.62 g/m². Annual productivities calculated by the Hynes method were 1.54 g/m² and 12.94 g/m². *Hexagenia* were not present in a third polluted river where the only common stream margin

macroinvertebrates were oligochaete species having a collective mean annual standing crop of 24.7 g/m². Length-frequency distributions indicate that *Hexagenia munda* has a one year (univoltine) life cycle in these rivers with adults emerging from May into September. Limited nymphal growth occurs during winter but last instar maturation does not take place until spring. There appears to be no discrete summer generation. Particle size of sediments limits nymphal distribution, smaller nymphs being capable of inhabiting sediments comprising higher proportions of sand. Nymphs harbor parasitic nematodes and are predominant prey for several species of fish.

(250)

Epidermal and Cuticular Properties of Leaves of *Smilax* L. (Smilacaceae) as Revealed by Light and Scanning Electron Microscopy

G. ANSLEY WALLACE AND ROBERT E. BALLARD
Clemson University

Epidermal peels examined by light microscopy and sections of whole leaf examined by scanning electron microscopy provide features which can be helpful in distinguishing the various species of *Smilax*. Useful characteristics include the presence of cuticular striations or protuberances, deposition of epicuticular waxes and the shape of epidermal cells. Features of the epidermis that have been misinterpreted in the past can now be understood.

(251)

Importance of *Magnolia macrophylla* (Magnoliaceae) in Disturbed Forest Sites in Piedmont North Carolina

G. ANSLEY WALLACE AND C. R. DILLON
Clemson University

Three sites in Gaston County, North Carolina, were selected to represent differing histories of disturbance. Vegetational analysis of each site was carried out to determine the importance of *Magnolia macrophylla* and other species in post-disturbance succession. In these areas, *M. macrophylla* seems to be very important in canopy replacement.

(252)

C-glycosylxanthone Distribution Among the "Primitive" Lower Vascular Plants

JAMES W. WALLACE
Western Carolina University

C-glycosylxanthones have rarely been encountered during chemical surveys of the plant kingdom. Even though all groups of land plants have been surveyed for polyphenolic compounds, C-glycosylxanthones have only been reported in a few flowering plants and three fern genera (*Asplenium*, *Athyrium* and *Elaphoglossum*). This

study is a survey for these compounds in the Lycopodophyta, (*Lycopodium*, *Selaginella Isoetes*); Equisetophyta, (*Equisetum*); Psilophyta, (*Psilotum*, *Tmesipteris*); Opnioglossales, (*Ophioglossum* and *Botrychium*); Marattiales, (*Marattia*, *Angiopteris*, *Danaea*, *Christensenia*) and Filicales (Hymenophyllaceae, Hymenophyllopsidaceae, Schizaeaceae, Stromatopteridaceae, Gleicheniaceae, Osmundaceae, Loxsomaceae, Cyatheaceae, Marsileaceae, Salviniaceae, Azollaceae). These compounds appear to be restricted to the primitive vascular plants being found only in the Hymenophyllaceae, Hymenophyllopsidaceae and the Marsileaceae. Previous reports have demonstrated their presence in the Aspleniaceae (*Asplenium*, *Athyrium* and *Elaphoglossum*). The phylogenetic significance of this will be discussed.

(253)

A Survey of the Aquatic Biota and Water Quality of the Appalachian Province of Eastern Kentucky

MELVIN L. WARREN, JR.
Kentucky Nature Preserves Commission

In light of the predicted acceleration of coal mining, there exists a great need to accurately assess the impacts of surface mining on aquatic ecosystems in eastern Kentucky. Immediate needs include: 1) establishment of baseline data, 2) formulation of permitting strategies allowing best possible recovery and 3) formulation and implementation of monitoring methodology within government resources. In order to approach these goals, fifty stream sites (heavily mined and forested), orders I-VII, were sampled biannually to determine flora, fauna and water quality. A stream classification matrix was devised utilizing sensitive water quality parameters and diversity (H') and equitability (J') of the macrobenthos. Those streams which exhibited values for specific conductance < 350 umhos, SO₄ < 60 mg/l, Na < 10 mg/l, Ca < 35 mg/l, H' > 0.6 and J' > 0.6 supported biota indicative of high quality aquatic systems. Modifying factors included watershed geology and land use practices exclusive of mining. Excessive siltation is the primary factor impacting the aquatic biota of eastern Kentucky.

(254)

The Current Status of Several Threatened and Endangered Fish Species in Kentucky

MELVIN L. WARREN, JR.
Kentucky Nature Preserves Commission

A two-year survey of the stream ichthyofauna of the Appalachian Province of eastern Kentucky in conjunction with the Kentucky Nature Preserves Commission heritage data base has contributed to the knowledge of the current status of several reported threatened and endangered fish species of Kentucky. In view of the inevitable impacts of coal mining on the streams and biota of the region, current information regarding the conservation status of the ichthyofauna is especially important. Distributional records, habitat notes and status are presented for several endangered fish species in Kentucky.

(255)

Taxodium, A Systematic Problem in the Southeastern Coastal Plain

FRANK D. WATSON

North Carolina State University

The taxonomic status of *Taxodium ascendens* Brongn. and its relationship to *T. distichum* (L.) Rich. is an important unresolved problem in the Southeastern Coastal Plain. A continuing comparative study utilizing various techniques will hopefully result in a clearer understanding of this problem as well as a more stable and realistic taxonomy of *Taxodium*. Evidence from several lines of investigation will be presented and evaluated in terms of the distinctiveness/similarity of the taxa involved. As yet, no formal decision has been made regarding the taxonomic rank of *Taxodium ascendens* Brongn.

(256)

Nutrient Contents and pH of Precipitation in Oak and Mixed Hardwood Forest Ecosystems

G. T. WEAVER AND JON D. JONES

Southern Illinois University, Carbondale

ROBIN G. BROWN

United States Geological Survey

Bulk precipitation at two locations in southwestern Illinois had an average pH of 4.8 during 1978. pH was < 5.7 during all seasons except autumn when the mean rose to 5.8. The seasonal pattern at these locations differs from that reported from more eastern regions where precipitation is most acidic during autumn. Non-acidic precipitation reoccurred in southern Illinois during the autumn of 1979. Concentrations of several plant nutrients including $\text{SO}_4\text{-S}$ were high during autumn, although the precipitation pH pattern was not reflective of the latter. Nutrient contents of precipitation were augmented by passage through the canopy of oak and mixed hardwood forests but were insufficient to alleviate acidity of precipitation reaching the forest floor during most seasons. The relationship between rainfall acidity and movements of plant nutrients through these ecosystems is also under study.

(257)

Mudflat Vegetation of Tennessee Valley Reservoirs

DAVID H. WEBB AND W. MICHAEL DENNIS

Tennessee Valley Authority

Water levels in Tennessee Valley Reservoirs are regulated for flood control, power generation, recreation and vector control. As a result of reservoir drawdown in late summer and fall, mudflats and shorelines are exposed and available for vegetative colonization. These habitats offer a unique ecological niche filled by a diverse assemblage of species dominated by members of

the Cyperaceae. Due to the extremely short growing season imposed on these species, most exhibit a diminutive growth form which little resembles their typical habit. Species composition varies little in similar habitats throughout the mainstream reservoirs of the Tennessee Valley, but species vary in abundance from year to year. Taxa found on mudflats and reported new for Tennessee include *Funbristylis vahlii*, *Hemicarpha micrantha*, *Hydrocotyle verticillata*, *H. umbellata*, *Oldenlandia uniflora* and *Pihularia americana*.

(258)

Species Biology of *Chrysosplenium iowense* (Saxifragaceae)

RICHARD M. WEBER

North Carolina State University

Chrysosplenium iowense Rydb., an endangered Pleistocene relict, is disjunct from more major populations in northwestern Canada. This plant occurs along the Niagara Escarpment within or adjacent to the driftless area in northeast Iowa. This endemic saxifrage occupies cold moist microhabitats on north-facing slopes. *C. iowense* was studied using the "Species Biology" method. This study was done to evaluate the status of the species in Iowa and the utility of the recently developed "Species Biology Unit." This method utilizes four fields of evidence from the population's life cycle: reproduction, dispersion, establishment and maintenance. The four life cycle phases are discussed along with the status of the species in Iowa.

(259)

Inhibitory Effects of Aflatoxin B_1 on Tryptophan-5-Hydroxylase

L. B. WEEKLEY, MIKE JONES, GERALD C. LLEWELLYN AND T. D. KIMBROUGH

Virginia Commonwealth University

In an effort to further characterize the effects of aflatoxin B_1 on tryptophan metabolism, both *in vivo* and *in vitro* studies were completed to observe the effects of aflatoxin B_1 on tryptophan hydroxylase. Earlier studies indicated dietary aflatoxin reduces both brain and duodenal serotonin. In the first study, an *in vitro* enzyme prep was used to determine kinetic effects of aflatoxin B_1 on tryptophan hydroxylase from rat hindbrain. The results suggest that aflatoxin B_1 acts as a competitive inhibitor of tryptophan hydroxylase with respect to tryptophan and the synthetic cofactor 6-methyl tetrahydropterin. This is consistent with results showing depressed serotonin in aflatoxin treated rats. Tryptophan hydroxylase, *in vivo*, is normally not saturated and hence only a competitive inhibition would reduce brain serotonin levels, assuming turnover is not affected, which has been previously demonstrated. The results of the second study show an intravenous injection of aflatoxin B_1 does act as a competitive inhibitor of tryptophan hydroxylase. These results strongly suggest that depressed serotonin by aflatoxin B_1 may play a role in the numerous metabolic effects of aflatoxin B_1 .

(260)

Determinants of Nekton Community Structure in Shallow Marsh Habitats, Cape Fear River, North Carolina

MICHAEL P. WEINSTEIN

Virginia Commonwealth University

The nekton of tidal creeks were studied at 17 sampling localities from September, 1977, through August, 1978, in the Cape Fear River estuary, North Carolina. Species recruited from the ocean utilized marsh habitats only temporarily and dominated the catches with over 70% of the total abundance. Their distribution was influenced by salinity gradients and to a lesser extent by substrate characteristics. In addition, temporal habitat partitioning with associated size differences of related species played an important role in structuring marsh communities. A clearly defined ecotone was associated with the mesohaline-polyhaline transition zone, in salinities between 14 and 21 o/oo. Numerous marine stenohaline forms were restricted to salinities above 16 o/oo, thus, increasing species richness in high salinity marshes. Despite differences in freshwater flows in 1977 and 1978, major features of the various marsh communities (species associations and relative abundances) persisted throughout the Cape Fear estuary indicating that these communities were relatively stable in time.

(261)

Effects of p,p'-DDT, p,p'-DDD, and p,p'-DDE on the Oxygen Uptake in the Freshwater Planarian, *Phagocata gracilis*

MARION R. WELLS AND BARBARA H. BATEY

Middle Tennessee State University

Oxygen uptake in planarians fed beef liver perfused with 10 ppm of p,p'-DDT, p,p'-DDD or p,p'-DDE in corn oil was not significantly different over a 96-hour period from that in planarians fed beef liver perfused with corn oil. These data indicate that 60-minutes exposure to 10 ppm of p,p'-DDT, p,p'-DDD and p,p'-DDE does not affect oxygen uptake in *P. gracilis*.

(262)

Allozyme Variation in the Eastern *Asplenium*: A Preliminary Report

CHARLES R. WERTH, SHELDON I. GUTTMAN AND W. HARDY ESHBAUGH

Miami University, Ohio

The fern genus, *Asplenium* L., in eastern North America represents an elegant example of a hybrid-polyploid-apomict complex whose species relationships have been clarified by cytogenetics and chromatography. We are carrying out a study of allozyme variation in this genus aimed at comparing congeners of differing ploidies and reproductive strategies. Populations of 10 species of *Asplenium* have been sampled over a major portion of their sympatric range and are currently being analyzed by means of starch gel electrophoresis.

(263)

Changes in Life History Traits of Rat-Strain *Nippostrongylus brasiliensis* (Nematoda) Upon Adaptation to the Golden Hamster

CAROLYN A. WEST

University of Maryland

Life history traits of *Nippostrongylus brasiliensis* in a rat-strain in rats and in hamsters and in a hamster-adapted strain in hamsters were examined. Differences were observed in juvenile mortality, adult survivorship, age at onset of reproduction (pre-patent period), length of patency, age specific reproduction and sex ratios. Age at onset of reproduction ranged from 5-5½ days in rat-strain in rats, 6-6½ days in rat-strain in hamster and 5½-6 days in the hamster-adapted strain in hamsters. Juvenile mortality was twice as high in rat-strain in hamsters than in rats. Juvenile mortality in the hamster-adapted strain in hamsters was intermediate between that observed in rat-strain in rats and in hamsters. The relationship of these differences in life history traits to the intrinsic rate of natural increase of the parasite population was analyzed in an ecological context.

(264)

A Review of Reproductive Cycles of the Live-bearing Fishes of the Family Poeciliidae with Emphasis on the Sailfin Molly, *Poecilia latipinna*

J. D. WETHERINGTON, H. L. LARGE AND F. F. SNELSON, JR.

University of Central Florida

In the live-bearing fishes of the Poeciliidae, the reproductive cycle is composed of two phases: 1) the vitellogenic period and 2) the gestation period. Different tactics have evolved for integrating these two components. At one end of the spectrum are species having overlapping reproductive cycles in which several broods in different stages of gestation occur simultaneously (superfetation) or in which the entire vitellogenic phase of one brood overlaps the gestation period of the previous brood. Alternatively, some species exhibit non-overlapping reproductive cycles in which vitellogenesis is initiated near the time of parturition. Intra-specific variation in the length of the reproductive cycle of both types will be discussed.

Poecilia latipinna has a non-overlapping reproductive cycle. Laboratory investigations showed the interbrood interval to be extremely variable, ranging from 26 to 68 days at approximately 28 C. Assuming that under constant conditions gestation period exhibits minimal variability, experimental evidence supporting the hypothesis that the observed variation is due to variation in the vitellogenic phase will be discussed.

(265)

Evidence for Bacterial Nitrogen Fixation in Hot Springs

CONRAD E. WICKSTROM
Emory University

Mature algal-bacterial mats from 25 alkaline hot springs of Yellowstone National Park were examined for nitrogenase activity. Light and dark serum bottles with mat cores and acetylene were incubated *in situ* at 30, 40, 50, 60 and 65 C in each spring. Some mats possessed only light dependent fixation (12%) while in other mats nitrogenase activity occurred only in the dark (22%); dark fixation was more common at all temperatures tested except 3 C. The latter class of mat was light repressed (i.e., presumably anaerobic) and permitted initial resolution between residual dark algal fixation and an independent dark fixation process. Mats with dark fixation gave stimulated responses to various carbohydrate enrichments, while algal fixation did not, and probably contained heterotrophic, anaerobic nitrogen-fixing bacteria. The total incidence of bacterial fixation was greater (51%) than algal fixation (41%); however, dark fixation accounted for < 5% of the nitrogen fixed in these systems.

(266)

Feeding Periodicity and Diet of the Bronze Darter, *Percina palmaris*

WERNER WIELAND
Auburn University

A preliminary analysis of diet and feeding periodicity was conducted on 91 adult *Percina palmaris* as part of a larger life history study. There was a single feeding peak in the late afternoon. Peak abundance of drift organisms occurred after sunset. Percentage occurrence of organisms in stomach contents was more similar to that in bottom than in drift samples. Male and female darters did not exhibit any apparent difference in diet. Stomachs contained a total of 12 identifiable taxa most prominent of which were mayflies (Siphonuridae) and black flies (Simuliidae). Relative abundance of these taxa in stomachs was much greater than in the environment indicating either preference on the part of *P. palmaris* or similarity of microhabitat and thus greater availability of these insect larvae. A total of 58 taxa were identified from the sampling site. Commonly occurring taxa in the diet were Siphonuridae, Simuliidae, Chironomidae, Hydropsychidae, Heptageniidae, Perlidae and Gastropoda.

(267)

Murphy's Pond: Has the Nature Conservancy Saved a Relict Cypress Swamp?

C. D. WILDER
Murray State University

One of Kentucky's last cypress swamps is described and characterized. The Nature Conservancy's role in saving the area from destruction, and the role of Murray State University in promoting its integrity is explained. Murphy's Pond has a unique position in the lives of local

citizens, yet presents a problem of conflict among local farmers, the University, the Environmental Protection Agency and the Army Corps of Engineers because of proposed channelization of adjacent Obion Creek. Possible effects of such channelization are discussed, especially in relation to present and future research at Murphy's Pond. The ultimate question is whether or not conflicting views of land use and State politics will destroy a "saved" natural area.

(268)

An Evaluation of Sampling Techniques for Hellbender (Amphibia, Cryptobranchidae) Populations

R. DAVID WILLIAMS, J. EDWARD GATES AND
CHARLES H. HOCUTT
Appalachian Environmental Laboratory

Five methods for sampling hellbender (*Cryptobranchus alleganiensis*) populations were compared in the Allegheny River drainage. Under conditions of controlled sampling effort, electroshocking methods accounted for 78% of the 87 individual captures. Hellbenders appeared to exhibit no differential displacement from electroshocking, and electroshocking success was independent of time of day and sampling site.

(269)

Soil Factors Related to the Distribution of *Sesbania punicea* (Fabaceae) in Florida

G. BRUCE WILLIAMSON AND EDWIN M. BLACK
University of South Florida

Sesbania punicea, a small tropical tree from Mexico, is now a Florida exotic found in isolated populations as far north as Jacksonville. The species suffers frost damage, often death. Soil samples on a disturbed site indicate that the tree's growth rate (dbh), population density and age of largest (dbh) individual are all associated with wet soil and high pH values. Stump sprouting after frost damage is evidenced in different numbers of stems on different soil conditions. Research suggests that with proper soil this tropical species, along with several others, may withstand mild frost and become common nursery trees in Florida.

(270)

Terpene Production in *Liquidambar styraciflua* L. (Hamamelidaceae)

JOE E. WINSTEAD
Western Kentucky University

Gas chromatography analysis of field collected leaf samples from 10 individual trees revealed 73 different secondary compounds of which 21 were present in more than trace quantities (0.1 of 1%). Five of the compounds made up over 63% of the total sample. The most abundant compounds were Alpha-pinene, Beta-pinene and Di-pentane. Under cooler growth conditions (24-16 C day/night temperature cycle) a reduction in

the synthesis of Alpha-pinene was noted compared to seedlings grown under warmer day/night cycles of 32-24 C in growth chambers. Since Alpha-pinene is the main constituent of oil of turpentine, synthesis of terpenes by sweetgum may prove to be important in studies involving the production of synthetic fuels.

(271)

Zonation in *Stemphylium* (Fungi Imperfecti)

FREDERICK T. WOLF
Vanderbilt University

Zonation is a phenomenon exhibited by a number of fungi when grown on solid media. It is characterized by the production of concentric rings of growth resulting from periodic fluctuations in the relative degrees of mycelial growth and sporulation. It may have a nutritional basis, in that a given fungus may zone on certain media, but not on others. It may be produced by alternating light and darkness, by temperature fluctuations, or there are a number of fungi which will respond to either of these. The complex of conditions inducing sporulation in an isolate of *Stemphylium*, subgenus *Pseudostemphylium*, will be discussed in relation to the studies of other workers concerned with this phenomenon in the closely related genus *Alternaria*.

(272)

Transmission Electron Microscopy
of *Desmognathus* (Plethodontidae) Spermatozoan
Cytoplasmic Droplets

J. W. EDWARD WORTHAM, JR. AND J. S. VANDEBERG
Old Dominion University

Spermatozoa from the vasa deferentia and testes of *Desmognathus ochrophaeus* were studied with the transmission electron microscope. The spermatozoan cytoplasmic droplets were ultrastructurally complex and contained mitochondria, laminated-like structures, smooth endoplasmic reticulum, ribosomes and membrane bound P-bodies. The P-bodies were approximately 0.23-0.35 μ m in diameter and several micrometers in length. Within the limiting membrane of the P-bodies were groups of parallel filaments each about 150A° in diameter. The number of filaments per P-body ranged from 6-13 with 10 being the typical number. The P-bodies were more abundant in the cytoplasmic droplets of spermatozoa taken from the vas deferens than from the testes. Mitochondria were found either randomly scattered in the droplet matrix or grouped into small clusters. Several of the cytoplasmic droplet mitochondria were found attached together by intermitochondrial junctions while no intermitochondrial junctions were very associated with the axial rod mitochondria. While the spermatozoan cytoplasmic droplet is a highly complex structure, its functional significance remains unknown.

(273)

Diatom Species Stability in Unperturbed Streams

J. T. WYATT
U.S. Army Environmental Hygiene Agency

As part of wider water quality studies involving several small streams in central Vernon Parish, Louisiana,

late-fall diatom populations from the years 1974 and 1979 are being closely compared. Since weather, limnological and sampling conditions were essentially similar in both studies, changes in the respective diatom communities separated in time by 5-year intervals ought to be relatively apparent. In 1974, the three most abundant species were, in order, *Eunotia pectinalis*, *Anomoeoneis serians* var. *brachysira* and *Frustulia vulgaris*; in 1979, only the first and last still appear to be dominant species. On the other hand, in 1974, about 20 different species of *Navicula* were present, with the generally uncommon forms, *N. mediocris* and *N. minuscula*, being most plentiful. With only partial analysis of the 1979 samples completed to date, substantial changes within the genera have occurred, and neither *Navicula mediocris* nor *N. minuscula* were common in this year's samples. Both specific and broader generalizations will follow the completed analysis.

(274)

Heavy Metal Concentrations and Physiological
Comparisons of *Morone saxatilis*: Cherokee,
Norris and Percy Priest Reservoirs

RICHARD C. YOUNG
Tennessee Valley Authority

Survey results show that on the average, copper concentrations in liver tissue followed the relationship, Norris > Cherokee > Percy Priest while for zinc, Cherokee $\approx$ Norris > Percy Priest. For kidney tissue, the average concentrations for both copper and zinc are approximately equal in all three reservoirs. These data do not indicate excessive accumulation of either zinc or copper in liver and kidney tissues of striped bass from either of the three reservoirs.

Total mercury concentrations in muscle tissue indicate that 37 percent of the striped bass from Cherokee had values greater than 0.5 μ g/g as compared to only 6 percent for the Norris fish. None of the fish analyzed from Cherokee or Norris exceeded the Food and Drug Administration limit of 1.0 μ g/g for total mercury. Histological analysis of tissues did not detect correlatable or significant pathologies in the fish studied.

(275)

Microscopic Observations on the Infection of
Mosquito Larvae by the Water Mold,
Leptoglenia sp. (Oomycetes)

WILLIAM ZATTAU AND THOMAS McINNIS
Clemson University

Zoospores of the fungus, *Leptoglenia* sp., act as primary agents of infection for larvae of *Aedes aegypti*. The spores encyst on the larval exoskeleton and penetrate into the coelom via a germ tube. Alternatively, spores germinate in the gut and germ tubes enter the coelom through the gut wall. Light and electron micrographs illustrate the stages of encystment, germination and penetration.

The Age and Growth of the Freshwater Mussel, *Lampsilis radiata luteola* (Lamarck)

MICHAEL A. ZETO
Marshall University

Age and growth analyses of height, weight, length and width of shells were conducted on a population of *Lampsilis radiata luteola* from a northeastern Kentucky stream. The population was analyzed by dividing the

stream into upper, middle and lower sectors. These stream sectors were compared by evaluating the mean, range, standard deviation and standard error of the mean of the various growth parameters. The overall size of the mussels in the stream sectors was also compared to food availability (plankton) with respect to age. Analyses of the entire combined population were conducted for similar growth parameters. It was concluded that *L. radiata luteola* obtained the majority of its shell length before the eighth year, while greater increments in weight occurred after the eighth year. It was further concluded that the overall growth, particularly weight, of the mussel was dependent upon food availability.

SYMPOSIA

41ST ANNUAL MEETING, 1980

I. Teaching Introductory Biology Courses — "Things That Work for Us."

Presiding: WILLIAM J. KOCH, University of North Carolina.

W. J. KOCH. Introduction.

W. J. KOCH AND E. R. WATSON. A Way to Meet the Peak Need of Large Classes. (Abstract No. 126).

W. J. ADAMS AND J. R. MEYER. The Use of Diagnostic Prescriptive Testing in an Introductory Biology Course. (Abstract No. 3).

T. L. MELLICHAMP. Why have a Speckled Toad-lily in Your Greenhouse: Evaluating Living Collections for Teaching Botany and Horticulture. (Abstract No. 159).

J. R. MASSEY. Some Games Systematists Play, 1. (Abstract No. 145).

J. F. MATTHEWS. Some Games Systematists Play, 2. (Abstract No. 145).

II. Endangered Plants, the Second Step.

Presiding: GAIL BAKER, Endangered Species Specialist, USFWS, Jacksonville.

GAIL BAKER. The Endangered and Threatened Plant Program of the U.S. Fish and Wildlife Service: 1975-1980.

LAVERNE SMITH, Office of Endangered Species, USFWS, Washington. The Endangered Species Act, the Listing Process and Provisions Relating to Plants.

RANDY LONG, USF, Atlanta. The Status and Recovery of Endangered and Threatened Plants on Southeastern National Forests.

KEN STANSELL AND ANDREW ROBINSON, USFWS, Atlanta. State Cooperative Agreements for Plants Under the Endangered Species Act, Requirements and Provisions.

MARY ANN NEVILLE-YOUNG, Georgia Game and Fish Division, Atlanta. Plant Management Programs in Georgia.

PAUL SOMERS, Tennessee Natural Heritage Program, Nashville. The Tennessee State Natural Heritage Program and Endangered Plants.

JAMES MASSEY, University of North Carolina. Conducting Plant Status Inventories.

RICHARD WUNDERLIN, University of South Florida. Problems of Determining Endangerment in Plants.

GARY TUCKER, Arkansas Tech University. Plant Status Surveys in the Southeast.

WAYNE MILSTEAD, Office of Endangered Species, USFWS, Washington. Current Status of Endangered Species Recovery Efforts by the U.S. Fish and Wildlife Service.

III. South Florida Ecosystems.

Presiding: MICHAEL J. DUEVER, Corkscrew Swamp Sanctuary.

M. J. DUEVER. Introduction to Area and Its Climate.

JOHN F. MEEDER, University of Miami. Geology and Soils.

BENJAMIN MCPHERSON, U.S. Geological Survey. Hydrology.

TAYLOR R. ALEXANDER, University of Miami. Plant Communities.

JAMES N. LAYNE, Archbold Biological Station. Animals.

SAMUEL C. SNEDAKER, University of Miami. Coastal Ecosystems.

JOHN REYNOLDS, University of Miami. Marine Ecosystems.

DANIEL F. AUSTIN, Florida Atlantic University. Prehistoric Human Interactions.

ARTHUR MARSHALL, Marshall Associates. Recent Human Interactions.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — James Wilkes, Troy State University

Florida — Vacant

Georgia — Fred K. Parrish, Georgia State University

Illinois — George T. Weaver, Southern Illinois University

Kentucky — Joe E. Winstead, Western Kentucky University

Louisiana — Harry J. Bennett, Louisiana State University

Maryland — Don Windler, Towson State University

Mississippi — Bruce Lacey, Mississippi University for Women

North Carolina — Vacant

South Carolina — G. Thomas Riggan, Jr., Newberry College

Tennessee — John R. Freeman, University of Tennessee at Chattanooga

Virginia — Jean Pugh, Christopher Newport College

West Virginia — Roy B. Clarkson, West Virginia University

JON R. FORTMAN — *News Editor*

Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

About People

Tuskegee Institute, Department of Biology. Dr. Julian E. Thomas has assumed the position of Head of the Department replacing Dr. O. C. Williamson who has been named Dean, College of Arts and Sciences. Dr. Thomas has recently returned to the Institute after serving a six month tenure at NIH as an Extra-mural Associate. As a result of his participation in the NIH program he has been made Director of Applied and Natural Science Research. In this position he also becomes an Associate Director of the Carver Research Foundation. Dr. Linda Phaire-Washington is the recipient of a NIH-MBS and a NSF grant to characterize the function of macrophages in various expressions of the immune response. She participated in the International Conference on Cancer Chemotherapy in Boston this past October. Dr. J. H. M. Henderson, formerly Director of the Carver Research Foundation and Acting Head of the Department of Biology for the 1978-79 school year, remains as Chairman of the Division of Natural Sciences and Senior Research Professor of Biology. Dr. Henderson's research involves *in vitro* culturing of cultivars of *Ipomoea batatas* in solid culture and cell systems. Other grants in the Department are under the supervision of Mrs. Carol S. Williams who is the Assistant Director of the Electron Microscopy Lab and conducts research on project grants from NIH, SEA/CR (USDA) and NASA. The E. M. Facility is under the direction of Dr. W. J. Sapp, formerly Head of the Department and now Dean of Students. He is still actively engaged in research sponsored by NASA. Dr. R. S. Saini has received two grants: a Standard Oil grant to train graduate students in entomology and a Chevron Chemical Company grant for the development of orthene insecticide. Mrs. Evelyn White has finished the course work and is currently working on her thesis for the Ed.D. at Auburn University. Two of the Department's faculty are on leave pursuing Ph.D. degrees at Auburn University. They are Mrs. Velma Richardson and Mrs. Helen Benford, working in the areas of genetics and development, respectively. Both are recipients of NIH-NIGMS-MARC Predoctoral Fellowships. Mr. Richard Eakin recently gave his impersonation of Gregor Mendel in a genetics lecture to the entire student body in the Institute Chapel. Dr. John W. Williams' major research interests are in molecular biology and cytogenetics. He currently has research support from SEA/CR (USDA) and directs graduate student research as a PIP in the Minority Biomedical Support Program. Two new instructors in the department are Messrs. P. Kalla and F. Uzor.

University of Florida, Department of Botany. Emeritus Professor Constantine Alexopoulos, University of Texas, will be spending the winter quarter, 1980, as Distinguished Visiting Professor in the Department. Dr. Lynn M. Hodgson, formerly of Hopkins Marine Station, has joined the faculty as Assistant Research Scientist. Dr. Hodgson is an algologist and will be carrying out research on aquatic plants of Florida. Beginning in the spring quarter, 1980, Professor David Anthony will introduce a new course, "Florida's Environmental Problems," to be presented under the aegis of the Department.

North Georgia College, Department of Biology. Mac A. Callahan, Department Chairman, has recently received a three year appointment as a consultant to the NSF Advisory Committee for the new Special Research Equipment Program.

Southern Illinois University, Department of Forestry. Jon D. Jones (M.S. Forestry, 1980) has accepted a position as Forestry Aid II at the Belle W. Baruch Forest Science Institute of Clemson University. Gerald M. Aubertin and George T. Weaver, Associate Professors, are operating a station within the National Atmospheric Deposition Program network.

Murray State University, Department of Biology. Recent activities of some faculty include attendance of a Marine Biological Laboratory short course entitled "Mariculture: Culture of Marine Invertebrates for Research Purposes" at Woods Hole by Dr. Jim Sichel and the January Ecology course by his student, Mike Heyn, who received a partial tuition scholarship.

University of Mississippi, Department of Biology. Dr. Edmund D. Keiser received grants from the Mississippi Mineral Resources Institute for ecological studies of amphibians, reptiles and mammals at strip mining sites in northern Mississippi and for an ecological study of Tatum Dome vertebrates. He was appointed to the Governor's Select Committee on Nuclear Energy and Nuclear Waste Repository. He is the recipient of the Governor's Meritorious Service Award, 1979. Two microbiologists joined the staff in August. Dr. Douglas J. Cork, Assistant Professor, and Dr. Gerard Pabst, Assistant Professor. Dr. Lyman A. Magee, Professor of Biology, is the Assistant Dean for the College of Liberal Arts, as of July, 1979. Dr. Douglas J. Cork has received grants to investigate microbial desulfurization of Mississippi lignite, kinetics of the conversion of kudzu to ethanol and the effect of a bacterial inoculation on waste treatment.

North Carolina State University, Botany Department. Professor **Charles Anderson** was on sabbatical leave during the Fall, 1979, semester at the Biology Department of Brookhaven National Laboratory. He pursued studies in the area of electron microscopy. Professor **James Reynolds** was awarded a NATO Fellowship to study at Glasshouse Crops Research Institute, Littlehampton, England, during the 1980-81 academic year.

Meredith College, Department of Biology. **Robert K. Reid** joined the Department this past fall. His Ph.D. is from North Carolina State University, Raleigh. **Dr. Reid** spent three years as a postdoctoral fellow in the Department of Biology at Yale University and most recently was a Research Scientist at Pfizer, Incorporated, in Groton, Connecticut, in the Central Research Division where he worked on plant regeneration from soybean tissue cultures. **Dr. Reid** is teaching genetics, botany, ecology and general biology and conducting research in plant tissue culture.

East Carolina University, Department of Biology. **Dr. Thomas J. Lawson** has been appointed Associate Scientist in the Institute for Coastal and Marine Resources and Visiting Associate Professor in the Department of Biology at East Carolina University. **Dr. Lawson** received the Ph.D. degree from the University of North Carolina at Chapel Hill. He has been a Research Associate at the Woods Hole Oceanographic Institute where his major interest was marine ecology. For the past three years he was involved in marine fisheries research in Iran. **Dr. Lawson** is studying collections from the U.S. Antarctic Research Program under contract with the Smithsonian Institution. **Mark M. Brinson**, Associate Professor of Biology, is on leave this academic year to work with the Eastern Energy-Land Use Team of the U.S. Fish and Wildlife Service in Kearneysville, West Virginia.

Vanderbilt University, Department of General Biology. Professor **Gary A. Polis**, Assistant Professor of Biology, joined the faculty September 1, 1979.

East Tennessee State University, Department of Biological Sciences. **Dr. Diane R. Nelson** has been awarded a NSF grant to support the Third International Symposium on the Tardigrada, August 3-6, 1980, at ETSU. Limited funds will be available to defray lodging expenses of graduate students attending the conference. Information, registration materials and applications for housing awards may be obtained from **Dr. Nelson**, Box 22900A, ETSU, Johnson City, Tennessee 37601. **Dr. J. L. Robertson** was elected Biology Section Editor for the Journal of the Tennessee Academy of Science for the next year. He was also elected as a Biology Section Chairman for the T.A.S. meeting for 1980.

Sweet Briar College, Department of Biology. Two additions were made to the faculty: **Warren R. Jones** (Ph.D. candidate, Indiana University) and **Willa Nehlsen** (Ph.D., University of California, Santa Cruz). **Mr. Jones'** research area is developmental genetics of ciliated protozoa, and **Dr. Nehlsen's** is lower plant development.

University of Virginia, Charlottesville, Department of Biology. **Oscar L. Miller**, Department Chairman (9/73-8/79) was elected to the National Academy of Science in April, 1979. **Robert M. Grainger** received a Research Career Development Award in September, 1979. The Department recently received private funds that are being used for graduate and postdoctoral fellowships both in Charlottesville and at the Mt. Lake Field Biology Station.

Western Kentucky University, Department of Biology. **Dr. Lewis B. Lockwood**, Adjunct Professor, has retired. **Dr. Lockwood** held the position of Assistant Director of

Microbiological Research at Miles Laboratory, Elkhart, Indiana, before coming to Western in 1971. **Dr. Thomas P. Coohill** has had his grant from the Food and Drug Administration approved. He is continuing studies of the effects of ultraviolet light on cells and viruses. **Dr. F. D. Bryant** and **Ms. Saaron P. Moore** are assisting **Dr. Coohill** on the project. **Dr. Robert Hoyt** was recently awarded a grant from NOAA to study the effect of controlled harvest on some biological characteristics of smallmouth buffalo in Rough River Lake, Kentucky. **Dr. Hoyt** has also received a grant from the U.S. Wildlife and Fisheries Service to study the seasonal fish fauna and movements of fish in the Barren River, Kentucky.

About Institutions

Murray State University. Hancock Biological Station will offer a variety of field-oriented courses this summer (June 2-27; July 7-August 1). Resident faculty will offer Ecology, Field Techniques, Algal Ecology, Limnology, Ichthyology, Field Biology, Birdwatching, Beekeeping, Edible Plants, Canoeing and Sailing. Visiting instructors will offer Population Biology, Experimental Embryology, Biometry, Ultraviolet Photobiology and Radiation Biology.

University of Southwestern Louisiana. A new two-story addition to the biology building has been opened. The 20,700 square foot facility contains teaching and research laboratories, a wet laboratory, the USL herbarium and zoological collections, cold storage area, dark room and a microscopy suite.

Duke Power Company Environmental Laboratories, Huntersville, North Carolina. Nearly 50 benthos workers attended the 6th Annual Carolina's Area Benthological Workshop, 8-9 November, 1979, hosted by Carolina Power and Light Company in New Hill, North Carolina. A draft copy of "Keys to the Aquatic Oligochaetes and Aquatic Insects of the Piedmont Carolinas" was reviewed by **Allison Brigham** and **John Unzieker**; this 800 page manual will be available in the spring of 1980, sponsored by Duke Power Company. The next meeting of CABW will be held during the first week of November, 1980, and will be hosted by Southeastern Reservoir Investigations (Attn: **Pat Hudson**), Hy 123, Bypass, Clemson, South Carolina 29631. The Benthos Group has completed a study of the life histories, growth rates, and production of *Corbicula* (Bivalvia), *Hexagenia* (Ephemeroptera), *Chaoborus* (Diptera), *Palpomyia* group (Ceratopogonidae) and major Chironomidae (Diptera) from three depth zones in Lake Norman, North Carolina. Data analyses are now in the final stages, and a summary report will be available in early 1980. Also, a weekly light-trapping program on representative bodies of water in the Piedmont Carolinas is planned in 1980.

59.06

The ASB

QH301
.A78
*

BULLETIN

Volume 27, Number 3

(ISSN 0001-2386)

July 1980

LIBRARY
SEP 3 1980
A. M. N. H.



ALBINO MUD TURTLE

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J.C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, PA.

Second-class postage paid at Philadelphia, Pennsylvania.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J.C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

Past President — James W. Hardin, Botany, North Carolina State University, Raleigh, NC 27650

President Elect — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Vice-President — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —
James L. Riopel (1981), Biology, University of Virginia, Charlottesville, VA 22901

Donald J. Shure (1981), Biology, Emory University, Atlanta, GA 30322

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Sewanee, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

AAAS Representative, Section G —
Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

A View From Here	79
Interest Piqued by Symposium	80
Association Affairs	81
News of Biology in the Southeast	85

COVER

An albino Eastern mud turtle. The hatchling was captured in one of the pitfall traps alongside the "mile long" drift fence that encircles a large Carolina bay on the Savannah River Plant, near Aiken, South Carolina. Although more than 5000 turtles have been marked and released as part of the life history studies on reptiles, this is the only albino to be found. Courtesy of *J. Whitfield Gibbons* and *Judith L. Greene*, Savannah River Ecology Laboratory. Photo by *Sylvia Greenwald*.

TIME AND PLACE OF FUTURE MEETINGS

1981	April 8-11	University of Tennessee, Knoxville
1982	April 14-17	Eastern Kentucky University, Richmond
1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984		Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA



The View From Here

The Editor has graciously consented to my saying a few words to the membership of ASB. I hope this is a presidential tradition in the making. It seems important to me that the ASB President have an opportunity to speak directly to each of the members. In this way you can learn of the major decisions by the executive committee and the activities which the President proposes for the year.

More than five hundred members registered for our meeting at the University of South Florida. The annual meeting of ASB is enriched by associated groups which join with us. Normally, we have six such groups. They are:

Beta Beta Beta

Dr. Paul Yokley, Western District Director, Univ. of N. Alabama, Florence, AL 35630;

Dr. R. L. Wyatt, Eastern District Director, Wake Forest Univ., Winston-Salem, NC 27109.

Southeastern Chapter, Ecological Society of America

Dr. Jerry M. Baskin, Chr., Univ. of Kentucky, Lexington, KY 40506.

Southeastern Section, Botanical Society of America

Dr. Robert R. Haynes, Chr., Univ. of Alabama, University, AL 35486.

Southeastern Division, American Society of Ichthyologists and Herpetologists

Dr. Vernon Powders, Pres., Ga. Southwestern College, Americus, GA 31709.

Southeastern Society of Parasitologists

Dr. Kenneth C. Corkum, Pres., Louisiana State Univ., Baton Rouge, LA 70803.

Southern Appalachian Botanical Club

Dr. James F. Matthews, Pres., Univ., of N. C., Charlotte, NC 28223.

Sometimes we have had plant physiologists, and at Tampa we had the South Atlantic Fishery Management Council. The Southeastern Section of the Botanical Society has co-sponsored the Thursday evening program at our annual meeting for the past two years. Others have aided in the development and presentation of special symposia. It seems apparent that our loose association has been mutually beneficial. I shall endeavor to improve this quasi-official relationship with each of the above organizations. In addition, it seems apparent that we need several additional groups to make our annual meeting a well-rounded conclave by which biologists in the Southeast can express their will and present their research findings to reputable peer groups.

Historically, the paper sections at our annual meetings have grown "willy-nilly," just like Topsy. Each local arrangements committee has looked at the papers as they arrived and hastily improvised sectional groups for presentation. This, frequently, means that chairpersons of paper sections have been quickly gathered with little opportunity to assess the group for whom they were responsible. Wouldn't it be better to assign some sections on a continuing basis so that paper section chairpersons can plan ahead and be aware of their responsibilities? Naturally, such groups would need to be flexible to accommodate the changing needs and interests of our Association.

New membership is the life blood of any organization. ASB is no exception. We are not growing as rapidly as we should and there are some areas in which we are falling behind. I have appointed James Riopel as a membership coordinator. He spoke ably on this subject at the Saturday March 29, executive committee meeting. It is his belief, and I support it, that we concentrate each year on the state where the annual meeting is held. We shall meet at the University of Tennessee, Knoxville, in 1981; Eastern Kentucky University in 1982; and Southwest Louisiana University in 1983. We hope to establish a pattern so that the state where the meeting is held will be saturated by a membership drive. This means that new members and prospective new members will not need to travel very far to see this society in action. The annual meeting should be our best sales point. We need particularly to solicit members in Microbiology and Genetics and for paper sessions to be

held for them. We need better representation in these important areas of Biology. We need also to address the major current research trends in each sub-discipline represented by paper sessions. We have addressed the issue of endangered species several times during recent meetings. Aren't there other current topics which should be addressed?

Each year we offer a meritorious teaching award and a research award. Sometimes, graduate students are in competition for the research award. They may feel the competition with experienced researchers is unfair for them. Perhaps we could do more for this enterprising and important group of young biologists. We do offer some expense money for attending the annual meeting. I think we could do more. Why not have a research award presented to the author of the best paper presented by a graduate student? Also, why not give the graduate student member an opportunity to advertise for a job in the January and April issues of the Bulletin free of charge? Then we might allow universities an opportunity to advertise vacancies in the ASB Bulletin at a nominal charge. I realize our bulletin is only quarterly, but the issues are arranged at strategic times for job placement. These changes would make our Association more appealing to the young biologists.

In 1986 we will have completed fifty years as an organization. We should plan now to make it a thoroughly exciting celebration. It seems appropriate that we return to the University of Georgia, where the first meeting was held in 1937.

Dr. Arthur Gentile, Executive Director of AIBS, spoke to the executive committee in Tampa on Thursday afternoon, March 27. It was obvious that there are many mutual concerns for Biology being addressed by both ASB and AIBS. However, the adherent society structure of AIBS is cumbersome and has some detrimental effects. The executive committee of ASB voted on Saturday morning to allow the adherent status of ASB to expire without any action. Our society can perhaps be most beneficial to the national needs of Biology as a discipline by being a strong regional organization. We can support the mission of AIBS as a strong independent organization. Also, we can urge the members of ASB to become members of AIBS.

We are continuing our liaison with the American Society for the Advancement of Science. Dr. Lafayette Frederick is our representative to Section G (biological sciences). We should strengthen this relationship to insure our input into Section G.

I have stated these matters to inform you of my thoughts and to solicit your comments. Please write or telephone.

— Franklin F. Flint, President

Interest Piqued by Symposium

There was an unexpectedly high attendance at the symposium, *Coping with Marginally Prepared Students in College-level Biology Courses*, held at the recent Annual Meeting at the University of South Florida. The symposium was well received and the level of audience participation indicates a substantial interest and concern by ASB members for the problems addressed. The problems enumerated were many and the projected solutions were few. One thing, however, was clear concerning the problems of biological education, i.e., *biologists* should actively seek solutions to such problems and their underlying causes. Biologists should not totally leave such important tasks to schools of education.

Perhaps the interests shown in this symposium are indicative of a widespread, general interest of the ASB membership in problems of biological education. If this is a true interpretation, then it seems reasonable and appropriate for our association to follow one or both of the following in the

future: a) encourage members to organize symposia on topics of general interest in biological education and b) set up a separate paper session for biological education for the annual meetings. In this way ASB can act in a leading role in the recognition and solution of problems in biological education as well as serving as a forum for the presentation and discussion of innovative approaches to biological education.

— **Wendell E. Wall**
Department of Biology
Univ. of Alabama in Birmingham

ASSOCIATION AFFAIRS

EARLIER DEADLINES AHEAD

Due to the relatively early date for the 1981 meeting in Knoxville (April 8-11) and the desire to have the April Bulletin with the program and abstracts in your hands well before the meeting, new and earlier deadlines have been established. **Titles and abstracts will be due October 15 this year.** Plan now for your contributed paper!

EMERITUS MEMBERS

A member of the ASB for ten or more years and who has retired from professional duties is eligible for election to Emeritus Membership. If you are retiring or have retired, believe you are eligible, and would like to become an Emeritus Member, please notify the Treasurer, Dr. J. C. O'Kelley, Box 1927, University of Alabama, University, AL 35486.

The following were elected to Emeritus Membership at the 41st Annual Meeting in Tampa.

Joshua C. Dickinson, Jr., Florida State Museum

Katherine Kever, Charlotte, NC

G. Ray Noggle, N. C. State Univ.

Hollis J. Rogers, UNC Greensboro

James T. Tanner, Univ. of Tennessee

Jesse S. White, Cleveland, MS

1980 EXHIBITORS

Air Products and Chemicals, Inc.
American Optical Corp.
Bausch and Lomb
Beckman Instruments (**Patron**)
Bio-Temp Scientific
Bodman Chemicals
Wm. C. Brown Co., Publ.
Carolina Biological Supply Co. (**Patron**)
Coulter Electronics
Electron Microscopy Sciences
Fisher Scientific (**Patron**)
Hunter Publishing Co.
Kewaunee Scientific Equipment Corp.
Martin Instrument Co.
W. W. Norton and Co.
PARCO Scientific Co. (**Patron**)
Preiser Scientific Inc.
Samuel's Scientific Instruments, Inc.
Sargent-Welch Scientific Co.
Southern Biological Supply Co.
SYBRON Laboratory Products
Technical Enterprises
Technics EM Systems, Inc.
University Presses of Florida
Ward's Natural Science Establishment, Inc.
Worth Publishers, Inc.

DR. ROBERT BROWN SHORT RECIPIENT OF 1980 MERITORIOUS TEACHING AWARD

The following was read at the presentation on March 28, 1980.

Tonight we honor a man distinguished for his research and service to Biology, but honor him, through the support of his students and colleagues, for his quality as a teacher. He has been President of the Association of Southeastern Biologists (1968-69), and of the Southeastern Society of Parasitologists (1971-72), and Vice-President of the American Society of Parasitologists (1977). At the Chattanooga meeting of the ASB he gave a keynote talk about graduate education in parasitology. His research has led to the opening of new aspects of his discipline, particularly parasite behavior, and he has encouraged his students to apply their own interest, such as immunology, to the study of parasites.

Some quotes from the supporting letters set the tone: "He was the unofficial 'pong' champion of the Vanderbilt Histochemistry Session of 1966. I came to realize that he approached ping-pong the way he does his teaching and research in parasitology and his service to his University and Community — with zeal, dedication, enthusiasm and excellence."

"I don't want to give the impression that he demanded greatness from us. It just so happened that each of us, in that environment, had his own idea of what constituted enough, what was good enough, and what reflected badly on each of us because it might be less than we were capable of doing."

"It was easy for me to move into new areas because of my broad training, and a philosophy he left me with that states: if ever you get tired of anything, then do something else, because you won't do your best in the absence of total enthusiasm."

"He was a task-master in the finest sense of the phrase. He asked nothing of his students that he would not do himself. By his actions, he imparted to us a need, yea a desire, for quality performance before the class and at scientific meetings and a desire for long hours in the lab. We worked without duress because we saw quickly that professional growth comes only with perseverance."

"In my experience, very few university teachers try to change or add to their course offerings when they are more than half-way through their careers. He has never been satisfied with the status-quo. (Also, he was never satisfied to leave the laboratories to graduate students only.)"

"His lectures were thorough and up-to-date, his labs were 'doing' experiences, making much use of fresh and living material, and students also benefited from study aids which he generated, for example — extensive ques-

tion lists. I pattern my general parasitology course after his."

"I remember one course in advanced helminthology. Six students were enrolled. We were charged to produce a research paper . . . five were later published in legitimate scientific journals."

"Rather than the dull phylogenetic recitation of organismal biology, he structured his courses around physiological topics. We were led to see parasitology not as a compendium of parasites, but as the science of parasitism; requiring the insights of immunology to animal behavior."

"His influence on me was immense. His message to his students, probably not entirely consciously rendered, is: scholarliness, integrity, and a balanced viewpoint toward living. If we took home just part of what he taught, we were advantaged. On the lighter side, his caustic sense of humor, counterbalanced by his own ability to take and appreciate a joke, was delightful."

This last comment is from the speech given by one of his students on acceptance of the Henry Baldwin Ward Medal.

Our honoree has worked with numerous honors and undergraduate research students and overseen the completion of 18 or more M.S. theses, 13 Ph.D. dissertations, and 6 postdoctoral fellowships from 1952-1979. Today former students are distinguishing themselves as teachers, administrators, veterinarians, and doctors (MD).

His own education included B.A. Maryville College, M.A. University of Virginia, and Ph.D. University of Michigan. Since 1950 he has been at the Florida State University, advancing from Assistant Professor to Professor in 1957.

The 1980 Meritorious Teaching Award is given with pride and appreciation.

— Margaret Gilbert, Chairman

1980 RESEARCH AWARD

The 1980 ASB Research Award, sponsored by Beckman Instruments, Incorporated of Norcross, Georgia, was won by **Jeffrey C. Luvall**, Ecology, Savannah River Ecology Laboratory, and **George T. Weaver**, Department of Forestry, Southern Illinois University. The title of their winning paper was "Distribution pattern of biomass and nutrients in the forest floor related to the structural attributes in southwestern Illinois upland forests." This paper represented an ambitious investigation in an area of basic importance, and was an important contribution to scientific knowledge.

THE ASSOCIATION OF SOUTHEASTERN BIOLOGISTS

TREASURER'S REPORT

January 1, 1979 — December 31, 1979

I. SAVINGS ACCOUNTS			
A. Burlington National Bank			
Balance Jan. 1	\$3,000.00		
Interest	217.50	\$ 3,217.50	
To Checking		3,217.50	
B. Ala. Mental Health Credit Union			
From Checking	3,000.00		
Interest	57.94	3,057.94	
To Checking		3,057.94	
C. First Ala. Bank Savings Acc't			
From Checking	5,000.00		
Interest	44.78	5,044.78	
BALANCE IN SAVINGS			\$5,044.78
II. CHECKING ACCOUNT			
Balance on Hand Jan. 1, 1979		\$ 5,086.17	
A. Receipts			
Regular Dues/Subscriptions	\$9,513.00		
Patron Memberships	775.00		
Reprints from April Bulletin	360.00		
Annual Meeting, Chattanooga	3,254.99		
Interest from Savings Account	275.44		
TOTAL RECEIPTS		\$14,178.43	
TOTAL RECEIPTS & BEGINNING BALANCE			\$19,264.60
B. Disbursements			
Membership and Publishing			
Production/Mailing/Roll	\$2,379.66		
Programs from April Bulletin	462.75		
Reprints from April Bulletin	404.70		
ASB Bulletin Vol. 26 (Printing)	7,099.10	\$10,346.21	
Office Expenses			
Treasurer (Postage, etc.)	128.13		
Editor (Postage, etc.)	99.78	227.91	
Travel & Related Expenses			
Student "Travel" Awards	1,400.00		
Oct. Exec. Comm. Meeting	838.99	2,238.99	
Meritorious Teaching Award		500.00	
Advance to Local Arrangements		250.00	
TOTAL DISBURSEMENTS		\$13,563.11	
TRANSFER TO SAVINGS (Net)		2,000.00	
BALANCE IN CHECKING Dec. 31, 1979			\$3,701.49
TOTAL ASSETS Dec. 31, 1979			\$8,746.27

Respectfully submitted,

(Signed) J. C. O'KELLEY

J. C. O'KELLEY *Treasurer*

Approved by the Auditing Committee, February 20, 1980.

Robert R. Haynes, Chr.

ASSOCIATION OF SOUTHEASTERN BIOLOGISTS: 1980-1981

OFFICERS, COMMITTEES, AND REPRESENTATIVES

PRESIDENT — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24503 (804/846-7392).

PRESIDENT ELECT — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065).

VICE PRESIDENT — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802 (813/683-5521).

RETIRING PRESIDENT — James W. Hardin, Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226).

SECRETARY — Carol C. Baskin (1982), Biological Sciences, University of Kentucky, Lexington, KY 40506 (606/258-8770).

TREASURER — J. Charles O'Kelley (1983), Biology, University of Alabama, University, AL 35486 (205/348-5960).

EXECUTIVE COMMITTEE MEMBERS-AT-LARGE — James L. Riopel (1981), Biology, University of Virginia, Charlottesville, VA 22901 (804/924-3981); Donald J. Shure (1981), Biology, Emory University, Atlanta, GA 30322 (404/329-4209); Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602 (404/542-3732); George S. Ramseur (1982), Biology, The University of the South, Sewanee, TN 37375 (615/598-5931); Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132 (615/898-2829); James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223 (704/597-2315).

AUDITING COMMITTEE — Chairman: Robert R. Haynes (1981), Biology, University of Alabama, University, AL 35486 (205/348-5960); Roy A. Dean (1981), Biology, University of Alabama, University, AL 35486 (205/348-5960); Ray Holton (1981), Botany, University of Tennessee, Knoxville, TN 37916 (615/974-2256).

CONSERVATION COMMITTEE — Chairman: Michael J. Baranski (1981), Biology, Catawba College, Salisbury, NC 28144 (707/637-4442); William H. Martin (1982), Natural Areas, Eastern Kentucky University, Richmond, KY 40475 (606/622-3122); Douglas A. Rayner (1983), South Carolina Wildlife and Marine Resources Department, Columbia, SC 29202 (803/758-6314).

LOCAL ARRANGEMENTS — J. Frank McCormick (1981), Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065).

PROGRAM CHAIRMAN — Hal R. DeSelm (1981), Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065).

MERITORIOUS TEACHING AWARD COMMITTEE — Chairman: Rudolph Prins (1981), Biology, Western Kentucky University, Bowling Green, KY 42101 (502/745-0111); James L. Riopel (1982), Biology, University of Virginia, Charlottesville, VA 22901 (804/924-3981); Beryl Franklin (1983), Biology, Northeast Louisiana University, Monroe, LA 71201 (318/342-3103).

NOMINATING COMMITTEE — Chairman: Raymond O. Flagg (1981), Carolina Biological Supply Company, Burlington, NC 27215 (919/584-0381); Ed Clebsch (1981), Ecology, University of Tennessee, Knoxville, TN 37916 (615/971-2256).

PAST PRESIDENT'S COUNCIL — Chairman: James W. Hardin (1981), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226).

PLACE OF MEETING COMMITTEE — Chairman: Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602 (404/542-3732); Bill Murdy (1983), Biology, Emory University, Atlanta, GA 30322 (404/329-4211); Cletus Sellers (1983), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6652).

PRIORITIES IN PUBLIC AFFAIRS COMMITTEE — Chairman: John R. Bozeman (1981), Georgia Department of Natural Resources, Brunswick, GA 31520 (912/264-7365); Stanwyn G. Shetler (1981), Botany, Smithsonian Institution, Washington, DC 20560 (202/381-5801).

RESEARCH AWARD COMMITTEE — Chairman: J. Kenneth Shull, Jr. (1981), Biology, Loyola University, New Orleans, LA 70118 (504/865-2769); George S. Ramseur (1982), Biology, University of the South, Sewanee, TN 37375 (615/598-5931); Diane Nelson (1983), Biology, East Tennessee State University, Johnson City, TN 37601 (615/929-4329).

RESOLUTIONS COMMITTEE — Chairman: James W. Hardin (1981), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226); Hal R. DeSelm (1981), Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065); Gilbert Trelawney (1981), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6225).

STUDENT AWARD COMMITTEE — Chairman: Diane T. Wagner-Werner (1981), Biology, University of South Florida, Tampa, FL 33620 (813/974-2011); Robert L. Beckmann (1982), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-3341); Jack Davis (1983), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6225).

EDITOR, ASB BULLETIN — James W. Hardin (1983), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226).

EDITOR, NEWS AND NOTES — Jon R. Fortman (1981), Biology, Mississippi University for Women, Columbus, MS 39701 (601/328-0812).

ARCHIVIST — Madeline P. Burbanck (1981), Biology, Emory University, Atlanta, GA 30322 (404/329-4205).

AAAS REPRESENTATIVE (Section G) — Lafayette Frederick (1982), Biology, Howard University, Washington, DC 20059 (202/636-6929).

CHANGE OF ADDRESS

It is your responsibility to notify the ASB when you have a change of address. Please make the change several months in advance since the Post Office charges ASB for first-class postage on returned mail. Send your new address to: Ms. Dorothy Hubbard, The Academy of Natural Sciences, 19th and the Parkway, Philadelphia, PA 19103.

News of Biology in the Southeast

JON R. FORTMAN — *News Editor*

Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE

University of Alabama in Birmingham, Department of Biology: **Dr. Robert Dean**, Assistant Professor, has been appointed as a marine biologist at Dauphin Island Sea Lab, Alabama. He is from Kenyon College, Ohio and has been with the lab since December 1979. His research interest is the biology of shipworms.

Auburn University, Dept. of Botany, Plant Pathology and Microbiology: **Dr. Paul A. Lemke**, formerly of Carnegie-Mellon University, has joined the faculty as Professor and Head of the Department.

Southern Arkansas University, Dept. of Biological Sciences: **Dr. Henry W. Robison**, Professor of Biology, recently assumed the office of President of the Arkansas Academy of Science.

University of Florida, Department of Botany: **Dr. Lynn M. Hodgson**, Ph.D. Stanford Univ., has been appointed Assistant Research Scientist. She will be devoting most of her efforts to research in the Aquatic

Weed Research Program. **Dr. George Bowes**, Associate Professor, presented a paper on his studies of photosynthesis in the Aquatic Plant Section at the meeting in Belfast of the Society of Experimental Biology. **Dr. Daniel B. Ward**, Professor, will be on sabbatical leave from June to November 1980 studying management of endangered species in western U.S. and Alaska. **Dr. Walter S. Judd**, Curator of the Vascular Plant Herbarium, has initiated a study of the generic relationships in the Miconieae and the systematics of *Agarista*. **Dr. David W. Hall**, a systematic botanist working in the Vascular Plant Herbarium, has initiated two projects of special interest to agriculture in conjunction with the weed identification and information functions of the Herbarium. **Dr. Constantine J. Alexopoulos**, Professor Emeritus of Botany at the Univ. of Texas, spent the winter quarter 1980 as a Visiting Distinguished Professor of Botany. **Dr. Sherwin Carlquist**, Horton Professor of Botany,

Claremont Graduate School and the Rancho Santa Ana Botanic Garden, California, will spend the period from early May to June as Visiting Distinguished Professor of Botany at the Univ. of Florida. **Dr. Richard A. White**, Chairman of the Dept. of Botany, Duke University, was a Visiting Professor in the department from April through May 1980. He presented a departmental seminar on "The Vascular Anatomy of Ferns: Development and Evolutionary Patterns."

University of Florida, Department of Zoology: **Dr. Lincoln P. Brower**, Stone Professor and Chairman of Biology, Amherst College, has accepted a new position as Professor of Zoology, Univ. of Florida. **William Calvert**, a post-doctoral fellow and other members of Brower's research group will move to Gainesville at the same time. Brower's research on the chemical ecology and overwintering populations of the monarch butterfly in Mexico and the Gulf Coast will be further expanded under the support of the Univ. of Florida's Quality Improvement Program funding.

West Georgia College, Department of Biology: **Mr. Robert B. England**, Associate Professor of Biology, has been named Assistant Director of Development and Alumni Services effective July 1, 1980.

Western Kentucky University, Department of Biology: **Dr. William G. Lloyd** has been appointed Dean of Ogden College of Science and Technology at Western Kentucky Univ. Dr. Lloyd comes from the Univ. of Kentucky's Institute for Mining and Minerals Research where he served as Associate Director. **Dean Marvin W. Russell** who has made significant contributions in serving as Dean since 1965 is returning to a faculty position. **Dr. Larry P. Elliott** was acknowledged as the "Outstanding Faculty Coordinator" by the Cooperative Education Association of Kentucky (1979-80). The National Science Foundation will support **Mr. J. Rodney McCurry** in a Pre-College Teacher Development in Science project.

University of Kentucky, School of Biological Sciences: **Dr. John Calkins** Associate Professor in the Department of Radiation, Medicine and Biological Sciences has been awarded a grant to direct an Advanced Research Institute which will be held in Copenhagen, Denmark in July 1980. The North Atlantic Treaty Organization awarded the grant to convene an international conference on "The role of solar ultraviolet radiation in marine ecosystems." The Advanced Research Institute will assemble leading scientists from a wide variety of fields including atmospheric chemistry, optical oceanography, photobiology, and marine ecology. For further information contact: **Dr. John Calkins**, Department of Radiation Medicine, University of Kentucky, 800 Rose St., Lexington, Kentucky 40536.

Louisiana State University in Shreveport: Publication of a new scientific journal, the *Bulletin of the Museum of Life Sciences*, has begun. The Journal includes a Checklist of the plants of Caddo Parish by **D. T. MacRoberts**; Checklist of the amphibians and reptiles of

Caddo and Bossier Parishes, Louisiana by **Laurence M. Hardy**; Checklist of the fishes of Caddo and Bossier Parishes, Louisiana by **Laurence M. Hardy** and **William H. LeGrande**. Three new faculty have recently joined the department. **Dr. Steven P. Lynch** (botany), **Dr. Cran Lucas** (cell biology) and **Dr. Maria Hardy** (physiology).

The University of, Southwestern Louisiana, Dept. of Biology: **Dr. Darryl L. Felder**, Associate Professor, will travel to Sydney, Australia to present a paper at the International Symposium on Evolution and Biology of Crustacea. **Ms. Emma Landra** recently retired from the faculty of the biology department. **Ms. Karen Fritze** has been appointed as Freshman Laboratory Coordinator. She received her M.S. degree from Florida State Univ. and has been employed as a Research Associate at FSU.

Louisiana State University — Baton Rouge, Department of Botany: **Dr. Bernard Lowy** and **Dr. William Luke** will retire in June 1980. Dr. Lowy will continue his research on Tremellales as an Emeritus Professor at LSU.

Mississippi College, Department of Biological Sciences: **Dr. Theodore Snazelle** joined the faculty on June 1, 1980, as Professor of Biology. Dr. Snazelle has the Ph.D. from Purdue University and has been at the University of Tennessee at Nashville for the past 10 years. **Dr. Prentiss G. Cox** has been named head of the department. Dr. Cox is Professor of Biology and has been at the College for 11 years. He is also President-elect of the Mississippi Academy of Sciences and will assume office on July 1, 1980. **Dr. Anne Meydrech**, Assistant Professor of Biology, served as acting head during the 1979-80 school year. **Mr. Louis C. Temple**, former head of the department, died in December 1979. **Dr. Bill P. Stark** was a symposium speaker at the recent meeting of the North American Benthological Society. The topic of his presentation was "Stoneflies of the Southeastern U.S." Dr. Stark has published six papers on stoneflies during the past year.

Gulf Coast Research Laboratory, Ocean Spring, Mississippi: Three members of the Laboratory attended the Aqua-culture '80 program in New Orleans in March 1980. **Dr. Robin M. Overstreet**, head of the parasitology section, moderated the World Mariculture Society oral technical session on disease. **John Ogle** of the oyster biology section presented a paper in the culture systems and aquaculture engineering session and **Mobashir Solangi** of the parasitology section presented a poster paper. **Dr. Sally Richardson** and **Dr. Joanne Laroche** have begun the second year of a study entitled, "The Role of Mississippi Sound in Recruitment to Sport and Commercial Fish Stocks." Mississippi Sound contributes significantly to commercial fishery landings in the Gulf of Mexico and the total Gulf accounts for one third of the national catch. **Dr. Llewellyn Erhardt**, Professor of Environmental Science at the University of Central Florida, recently gave a seminar at the Gulf

Coast Research Laboratory on weighing, tagging, and measuring nesting turtles, and tracking unobserved turtles to locate their nests. **Dr. Julia Lytle**, head of the environmental chemistry section has been named to the board of directors of the Mississippi Mineral Resources Institute. **Dr. David W. Cook**, registrar of the academic program offered by the GCRL announces the opening of registration for summer courses. Fifteen courses will be taught in two six-week terms. The first begins June 2 and ends July 11, and the second term extends from July 14 to August 22. Applications for the summer program and information concerning fees, living accommodations, etc. may be obtained by writing The Registrar, Gulf Research Laboratory, Ocean Springs, MS 39564. **Dr. Richard Heard** and **Dr. Robin Overstreet** began work on the gathering of information on the larger invertebrates of the Mississippi and Alabama coasts for the purpose of compiling a comprehensive checklist and bibliography. **Dr. Joanne Laroche** has been awarded the Ph.D. from the University of Maine, Department of Oceanography. Her research involved a study of larval fishes in an estuary in Maine.

Duke Power Company, Environmental Laboratories: **Alan Giles** has joined the Aquatic Benthic Macroinvertebrate Group at the Environmental Lab. **Tom Wilda** is completing a summary report on the benthos of Lake Norman, N.C., for the period of 1974-1979. **Karen Eaton** is working on a study of the distribution of macroinvertebrates in the Catawba River reservoirs of the Piedmont Carolinas. **James Hall** is completing a study of the growth rates of the Asiatic Clam, *Corbicula*, in Lake Norman, N.C., and is also estimating the growth rates and production of *Hexagenia* in the lake. **Dave Braatz** is working on growth rates and production of predaceous chironomid subfamily Tanypodinae in Lake Norman, and is beginning a monitoring program of the benthos of Howard Creek, in Northwestern S.C. **Tommy Bowen** is studying the taxonomy of aquatic Ceratopogonidae and updating distribution records for the Carolinas. The manual "Keys to the Aquatic Insects and Oligochaetes of the Piedmont Carolinas," sponsored by Duke Power Company, is to be available in the summer of 1980.

North Carolina State University, Dept. of Horticultural Science: Recent additions to the faculty are: **Dr. Paul Fantz**, Assistant Professor, a taxonomist from Fairchild Tropical Garden teaching in the area of ornamental plants. **Dr. Katharine Perry** and **Mr. Greg Johnson**, Agricultural Meteorologists, developing a new Agricultural Weather Program for the state of North Carolina. **Dr. Barclay Poling**, Extension Horticulturist, is in charge of Small Fruits Extension. **Mr. Larry Bass**, Extension Horticulturist, is responsible for Home Horticultural Extension. **Dr. D. C. Sanders** began a 1-year sabbatical at the USDA Water Research Lab, Fresno, California. His research project is entitled "Overhead trickle irrigation on direct seeded pepper and tomatoes." **Mr. George**

Hughes was appointed Specialist in charge, Extension Horticulture, replacing **Dr. Al Banadyga**, who retired December 30, 1979. **Dr. Don Zeiger**, Research Pomologist stationed at Fletcher Research Station, retired in June, 1980.

Duke University, Department of Botany: **W. D. Billings**, James B. Duke Professor of Botany, attains emeritus status at the end of this current academic year. In September, 1980, **William H. Schlesinger**, plant ecologist and currently on the faculty of The University of California, Santa Barbara, will join the Botany faculty. **Dr. William Louis Culberson**, Professor of Botany, has accepted an invitation from the French Government for a three-month visiting research professorship this Spring in the Muséum National d'Histoire Naturelle in Paris. He will work in the Laboratoire de Cryptogamie. His wife, **Dr. Chicita F. Culberson**, Adjunct Professor in Botany, will work in the Laboratoire de Chimie Appliquée aux Corps Organisés of the same institution.

University of North Carolina at Charlotte, Dept. of Biology: **Dr. James D. Oliver** has been awarded a grant by the Institute of Allergies and Infectious Diseases for a three year study on the distribution and ecology of the newly reported lactose-positive *Vibrio*. The organism on which Dr. Oliver is working is a lethal or potentially lethal marine bacterium found in oysters and other sea organisms. The vector for man is the ingesting of raw oysters or the penetration of the organism through open wounds of swimmers or persons in contaminated sea water. **Deborah Langsam**, who will receive her Ph.D. from Duke University, summer 1980, has been appointed as Assistant Professor. **Dr. Philip Hildreth**, Vice-Chancellor for Academic Affairs, is returning to the department as Distinguished Professor in Genetics and Biology, effective June 1, 1980. **Dr. Roger H. Trumbore**, Chairman of the Department, has been appointed to the Task Force on Leadership in Allied Health, a committee of the American Society of Allied Health Professions. **Dr. James F. Matthews**, Professor of Biology, was elected President of the Southern Appalachian Botanical Club. **Dr. Mary Beth Thomas**, Professor of Biology, was elected to the Board of Directors of the North Carolina Academy of Science.

North Carolina State University, Department of Zoology: **Dr. Thomas L. Quay** has retired from the Zoology Department after 38 years of dedicated service. He will continue as an Emeritus Professor and will continue to pursue his ornithological interests at the N.C. Museum of Natural History. **Dr. Roger Powell** has been appointed as an Assistant Professor of Zoology and Forestry. Dr. Powell holds a Ph.D. from the University of Chicago and has held a previous post at the University of Illinois. He will conduct research in the area of mammalian ecology. **Dr. Betty Black** has joined the faculty as an Assistant Professor of Zoology. She holds a Ph.D. from Washington University in the area of developmental biology. **Dr. Gary J. San Julian** has been

appointed as an Assistant Professor of Zoology. Dr. San Julian received his Ph.D. from Colorado State University and will be the Wildlife Extension Specialist.

Wake Forest University, Department of Biology: **Dr. Walter S. Flory**, Babcock Professor of Botany, has retired from the Department of Biology. Dr. Flory was President of ASB 1962-1963. Professor Flory plans to remain an active researcher, continuing with his lifetime study of the Amaryllidaceae. Joining the Department as the new Babcock Professor of Botany is **Dr. Mordecai Jaffe**, a plant physiologist, with interests in morphogenetic responses of plants to mechanical stimuli or stress. Also joining the faculty are **Dr. Carole Browne**, a cellular biologist, and **Dr. Robert Browne** an ecologist with interests in the evolution of reproductive strategies among various invertebrate animals. Both received the Ph.D. from Syracuse University, followed by postdoctoral training at UNC-CH and NCSU.

College of Charleston, Biology Department: **Susan J. Morrison** has joined the biology department. She is currently completing her doctorate at Florida State University in marine and estuarine microbial ecology.

University of South Carolina, Department of Biology: **Dr. N. C. Mishra** is on sabbatical leave at the Max Planck Institute, Heidelberg, W. Germany until June 30, 1980. **Dr. Bruce Coull** presented an invited paper at the American Society of Zoologists meeting in Tampa, Florida, on December 26, 1979.

Francis Marion College, Department of Biology: **Dr. Tom Roop** will conduct a marine biology course for high school teachers during the summer of 1980.

University of Tennessee — Knoxville, Dept. of Botany: **Dr. A. J. Sharp**, Emeritus Professor of Botany, is continuing the preparation of a manual of Mexican mosses.

Middle Tennessee State University, Department of Biology: **Dr. John A. Patten** will be retiring after 29 years in the department. He has served as the department chairman since its inception in 1960. Recently he was honored by the Governor of Kentucky who made him a Kentucky Colonel. Dr. Patten also received the Outstanding Teacher Award at MTSU for 1979-80, and was honored by the Tennessee Legislature who passed a resolution commending him for his many years of service in education. **Dr. George Murphy**, a faculty member of the department since 1969, has been named department chairman beginning July 1, 1980. **Dr. Charles R. McGhee** was recently promoted to Professor of Biology. He received his Ph.D. from Virginia Polytechnic Institute.

Virginia Commonwealth University, Department of Biology: **Dr. Miles F. Johnson** has been promoted to Professor of Biology.

University of Richmond, Department of Biology: **Mr. W. John Hayden**, who will receive the Ph.D. in Botany from the University of Maryland, will join the staff in August 1980.

Virginia Polytechnic Institute and State University,

Biology Dept.: **Henry Bauer**, Dean of the College of Arts and Sciences has announced the appointment of **Ernest R. Stout**, Associate Professor of Botany, to Head of the Biology Department. He succeeds **George M. Simmons, Jr.**, Acting Head of Biology since April 1979. Dr. Stout came to Tech in 1967 as an Assistant Professor. He has served as Assistant Dean of Graduate Studies and Research and as a member of the Faculty Senate for three years and the University Council for one. He obtained his Ph.D. from the University of Florida and was a National Institute of Health Postdoctoral Fellow at the University of Maryland.

Warren Wilson College, Department of Biology: **Dr. Malcolm Smith** has recently joined the biology department. Dr. Smith is a molecular biologist and received his advanced degrees from Harvard and Washington University in plant chemistry. **Jean MacGregor** has also joined the staff in the area of environmental studies. She is a nationally recognized environmental educator. **Dr. Alan Haney** leads the resource management program which has established a 3/2 program with Duke School of Forestry and Environmental Studies for students that wish to initiate graduate training earlier in their program. **Dr. Thomas McKinney** heads the general environmental studies program which encourages students to develop majors in traditional areas, such as chemistry and economics with environmental minors.

Old Dominion University, Dept. of Biological Sciences: **Dr. Stephan R. Larrick** has been appointed to the faculty where he will present courses in comparative anatomy and assist in the ichthyology program. **Dr. Lytton Musselman**, Associate Professor in Biological Sciences is on an 8-month leave of absence in Oxford, England where he is conducting studies at the Weed Research Organization.

Roanoke College, Department of Biology: **Dr. Robert E. Jenkins** has returned to the department as Associate Professor. He continues to pursue studies of systematics, zoogeography, and life history of Freshwater Fishes. His work on a book of the Freshwater Fishes of Virginia has been funded by a grant from the Virginia Water Control Board.

Dr. John C. Strickland, Former Biologist at University of Richmond, *Succumbs*. Dr. Strickland, a specialist in blue-green algae and former chairman of the Univ. of Richmond biology department died February 23, 1980. A native of Petersburg, Dr. Strickland was awarded the Ph.D. from the University of Virginia. He taught biology at the College of William and Mary for three years and then joined the University of Richmond faculty in 1946. He was promoted to full professor in 1958 and served as chairman of the department from 1957 until 1965. He remained a professor at UR until his retirement last year. Dr. Strickland published a number of papers on the classification and culture of various strains of blue-green algae, and was a member of numerous professional organizations.

ABOUT INSTITUTIONS

North Carolina State University, Dept. of Horticultural Science. A new agricultural weather program for the state of North Carolina has been initiated. Housed in the Horticultural Science Department, the program encompasses all agricultural departments on campus, and is jointly funded by grants from both the National Weather Service and USDA, SEA:Extension. Two specialists have been added to the faculty to develop a program to provide more accurate and timely weather information tailored to agricultural interests. During the past 3 years under the direction of *Dr. J. C. Raulston*, the development of a teaching and research arboretum has been in progress with 4 acres of planting area and roughly 1,200 species and cultivars of mostly exotic plants installed. The arboretum was recently awarded a grant by the Z. Smith Reynolds Foundation for construction of a parking lot, visitor center, rare plants house, and model gardens. Ultimate plans call for 9 acres and 3,000 species with most of the development to be completed by 1984.

Murray State University, Department of Biological Sciences. As a result of meetings held in April among representatives of 16 institutions, a new scientific and educational consortium may be formed around the facilities of Hancock Biological Station and the educational/research resources and opportunities of the Land Between the Lakes and Kentucky and Barkley Lakes. Other potentially interested institutions should contact *C. E. Kupchella*, Chairman, Biological Sciences, MSU, Murray, KY 42071.

Mississippi-Alabama Sea Grant Consortium. On April 29-30, MASGC hosted Sea Grant directors from throughout the United States in a two-day conference at the National Space Technology Laboratories in Bay St. Louis, Mississippi. *Dr. James I. Jones*, MASGC director, serves as chairman of the national Council of Sea Grant Directors.

The Crustacean Society, a formal society to serve as a focal point for studies on all aspects of crustacean biology, was recently established at a meeting in Tampa, Florida. One of the Society's goals will be the prompt publication of member's shorter manuscripts on any aspect of crustacean biology. The Society's journal will begin publication in 1981. Membership in the Society is open to anyone interested in Crustacea. There are no prerequisites. Those interested in joining the Society should write to: The Crustacean Society, c/o *R. B. Manning* IZ-NHB-W323, Smithsonian Institution, Washington, DC 20560, U.S.A.

Duke University, Department of Botany. The Botany Department will completely renovate their greenhouse facilities with funds from NSF and Duke University. The NSF funding was awarded for a project entitled "Facilities for Plant Science Research" under the direc-

tion of *Dr. Richard A. White*, Chairman, Department of Botany.

Tennessee Technological University, Department of Biology. An NSF grant was received for training area secondary school teachers in sciences. Physics, Chemistry, Biology, Geology, Geography, Economics, Engineering, and Science Education will be covered. *Dr. S. K. Ballal*, Professor of Biology, will be the Project Director. The program is scheduled for the summer of 1980.

The U.S. Environmental Protection Agency has established a Cooperative Agreement with **North Carolina State University** for coordination and management of EPA's in-house, short-term and long-term programs of research on the biological effects of acid precipitation. The primary goal of the overall program is to provide EPA with an improved understanding of the effects of acid precipitation on aquatic and terrestrial ecosystems in various regions of the United States. *Dr. Ellis B. Cowling*, Chairman of the National Atmospheric Deposition Program, Associate Dean in Forest Resources, and Assistant Director of Agriculture Research at NCSU serves as Program Director at NCSU. Coordination and management efforts relative to the Program are based in the **Botany Department** at NCSU. *Dr. Rick A. Linthurst* has recently been appointed to the Botany Department and serves as Program Coordinator. Inquiries relative to the Program should be directed to him at: NCSU, Department of Botany, P.O. Box 5186, Raleigh, NC 27650.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Emory University Museum. The museum has received a grant from HEW (Institute of Museum Services) for the production of brochures, flyers, and slides. The money will also allow the museum to extend the hours it is open to the public. The museum has extensive collections of biological materials which are used by the Biology Department in many of their research and study programs. Thirteen bulletins on insects of Georgia have been completed during the years. A major part of the museum's insect collection is on loan to the University of Georgia.

Mississippi Museum of Natural Science. The museum is divided into Administrative, Educational, and Research Sections. The Education Section is divided into the Education and Exhibit Programs. The Research Section is divided into the Curatorial and Natural Heritage Programs. The Educational Program and Exhibit Program have been recovering during the past year as a result of the flood that badly damaged the museum in April 1979. It is estimated that it will take about 18 months to restore the exhibit hall; however, visitors are welcome at any time to observe what exhibits have been

installed and view educational films. The Curatorial Program is made up of Curators in Invertebrates, Botany, Paleontology, Mammalogy, Ichthyology/Herpetology, and Ornithology. The Invertebrate, Botany, and Paleontology collections began in 1978. The other collections go back to the WPA days. The Natural Heritage Program is a state-wide inventory of natural and/or ecologically significant areas that is based on the distribution of rare and/or endangered fauna and flora, plant communities, aquatic types, and such special features as caves, waterfalls, fossil formations, geological type localities, champion trees, and rookeries.

The Charleston Museum. The Museum is now located in a new six-million-dollar building, the first structure ever built specifically for this museum. Those who recall the dusty old firetrap that contained the museum for more than seventy years will breathe easier now that the important collections in zoology, botany, paleontology, geology, and cultural history are housed in a modern building with temperature and humidity control. The building is a 72,000 square-foot quadrangle enclosing an 11,000 square-foot courtyard for outdoor ex-

hibits and programs. The Natural Sciences department is particularly pleased with its new preparation room, which is equipped with a walk-in freezer, a cooler, and many other modern facilities. The natural history exhibits are in the initial stages of construction. The new address of the museum is: 360 Meeting St., Charleston, S.C. 29403. Telephone: (803) 722-2996. The museum staff wishes to invite their ASB colleagues in for a visit whenever they are in the area.

Fairchild Tropical Garden, Miami, Florida. Fairchild Tropical Garden has recently completed an addition to its research center which adds a new 1260 sq. ft. classroom/laboratory, as well as office space and a preparation room for the herbarium. The classroom space will be available to visiting college classes. Many biology classes now visit the Garden's 83 acre collection of tropical and subtropical plants, especially while on field trips to South Florida during the winter months. For further information on use of the classroom/laboratory contact: *Dr. John Popenoe*, Director, Fairchild Tropical Garden, 10901 Old Cutler Rd., Miami, FL 33156.

NECROLOGY

During the past year, the Association lost by death the following members:

Chauncey G. Goodchild, Biology Department, Emory University, Atlanta, GA.
Joined 1953.

Lemuel R. Hesler, Department of Botany, University of Tennessee, Knoxville, TN.
Joined 1947.

Thelma Howell, Highlands, NC. Joined 1943.

John R. Rawls, Biology Department, University of South Alabama, Mobile, AL.
Joined 1958.



59.06

QH301
.A78
*

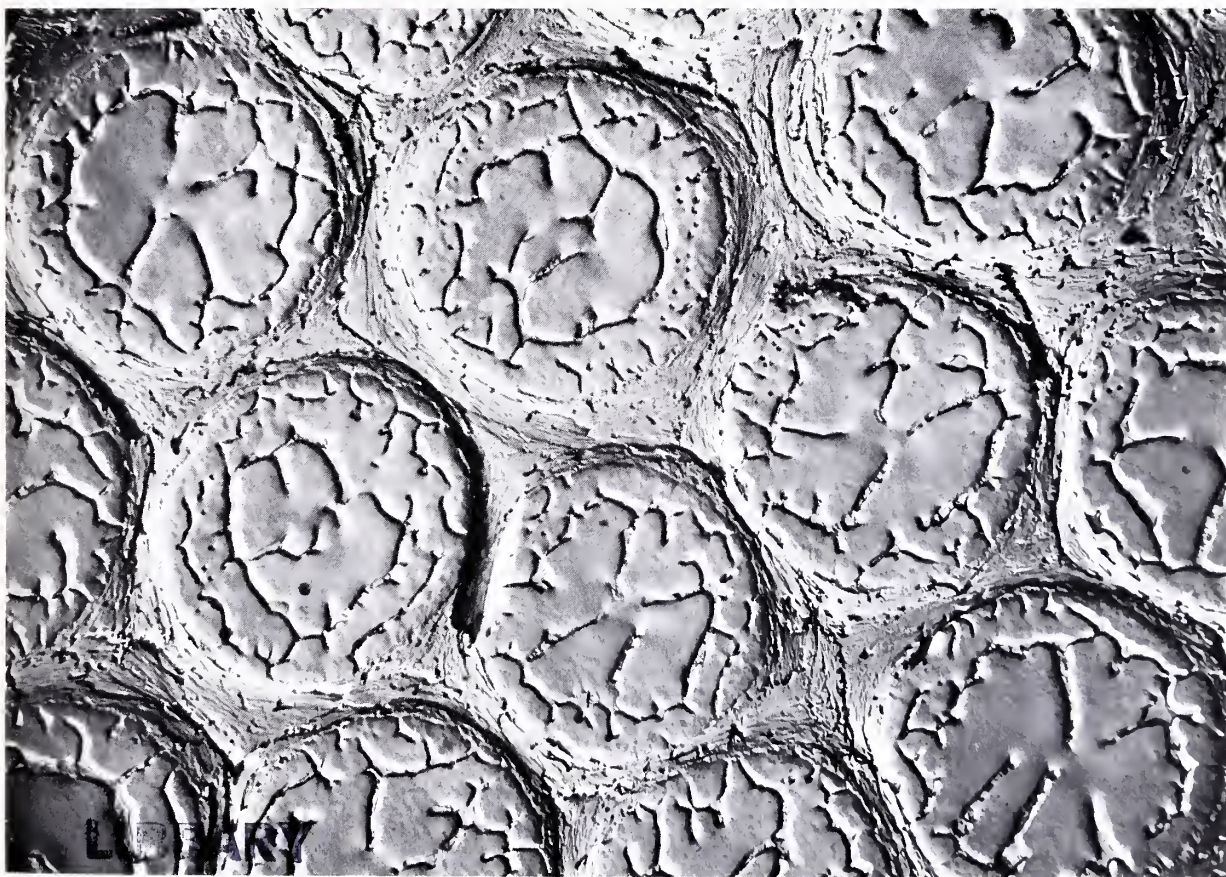
The ASB

BULLETIN

Volume 27, Number 4

(ISSN 0001-2386)

October 1980



JAN 2 1981

Pit Membranes in Wood

A. M. N. H.

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Pennsylvania in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J.C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, PA.

Second-class postage paid at Philadelphia, Pennsylvania.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J.C. O'KELLEY, Business Manager

OFFICERS OF THE ASB

President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504
Past President — James W. Hardin, Botany, North Carolina State University, Raleigh, NC 27650
President Elect — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916
Vice-President — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802
Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506
Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486
Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333
Executive Committee —
 James L. Riopel (1981), Biology, University of Virginia, Charlottesville, VA 22901
 Donald J. Shure (1981), Biology, Emory University, Atlanta, GA 30322
 Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602
 George S. Ramseur (1982), Biology, University of the South, Sewanee, TN 37375
 Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132
 James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223
AAAS Representative, Section G —
 Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

Association Affairs	95
News of Biology in the Southeast	97
Index of Current Plant Systematic and Ecological Research in the Southeastern United States	100

COVER

TEM view of pit membranes of inter-vessel pits of white ash sapwood, $\times 10,000$. Courtesy of Dr. Elizabeth A. Wheeler, Department of Wood and Paper Science, North Carolina State University, Raleigh.

TIME AND PLACE OF FUTURE MEETINGS

1981	April 8-11	University of Tennessee, Knoxville
1982	April 14-17	Eastern Kentucky University, Richmond
1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984		Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
 Parco Scientific Company, Vienna, OH
 Fisher Scientific Company, Chicago, IL
 Olinkraft, Incorporated, West Monroe, LA
 Beckman Instruments, Incorporated, Norcross, GA



ASSOCIATION AFFAIRS

FORTY-SECOND ANNUAL MEETING AT

THE UNIVERSITY OF TENNESSEE

KNOXVILLE, TENNESSEE

8-11 APRIL, 1981

In preparing for the 1981 meeting in Knoxville, please note the deadlines which are earlier than in recent years. Members can facilitate arrangements for the meeting by sending all requested material as far in advance of the deadlines as possible. See the "Call-for-Papers" sent to you separately, for details.

Research Prize and Meritorious Teaching Award. In recent years the number of papers submitted for consideration for the research prize has been low. Likewise, nominations for the Meritorious Teaching Award have been few. Members should take advantage of these opportunities. See the details in the "Call-for-Papers."

New Deadlines:

October 15 — Titles and abstracts for the Knoxville Meeting

October 15 — Nominations for ASB Offices and Executive Committee members

December 1 — Applications for graduate student "Travel Awards"

January 1 — Entries for ASB Research Award

January 1 — Nominations for Meritorious Teaching Award

This year, for the first time, a pre-registration form is available below. This should be duplicated and one sent for each person planning to attend the annual meeting in Knoxville. This new procedure should speed up registration and allow the local arrangements committees to better plan for luncheons, banquet, meeting rooms, etc. Please send a copy in now. Registration, as usual, can be completed upon arrival.

ASB PRE-REGISTRATION FOR KNOXVILLE MEETING

(type or print, one for each registrant)

Name -----

Institution -----

City ----- State ----- Zip -----

Check the following: Registration: Regular \$5.00 ----- Student \$3.00 -----

ASB Banquet: Faculty \$6.75 ----- Student \$5.00 -----

Ecology Lunch \$4.00 ----- Parasitology Lunch \$4.00 -----

Field trip No. ----- Transportation needed \$5.00 or \$3.00 -----

Send copy of this form and check by April 1st to: Department of Conferences, University of Tennessee, 1629 Melrose Ave., Knoxville, TN 37916; or call 615/974-5261 if charge card is used.

FIELD TRIPS PLANNED

Ten field trips are planned for Saturday, April 11. If you plan to go on one of these, please indicate the number on your pre-registration form. If transportation is needed, add the amount per person to your pre-registration total. The amounts indicated may be readjusted at registration depending upon participation.

1. Aquatic Research Programs in the Great Smoky Mts. National Park. \$3.00
 2. Vegetation and Floristic Studies in the GSMNP. \$3.00
 3. Wildlife Research in the GSMNP. \$3.00
 4. Environmental Monitoring and Resource Management in the GSMNP. \$3.00
- (These 4 trips will be conducted by the Upland Research Lab. staff of the GSMNP.)
5. Natural History of the Great Smoky Mountains. Led by Dr. Ed Clebsch. \$3.00
 6. TVA Natural Resources Division and Surface Mine Reclamation Sites. \$3.00
 7. Obed River National Wild and Scenic River Area in the Cumberland Mts. \$3.00
 8. Environmental Sciences Division and Biological Sciences Division of Oak Ridge National Lab. \$3.00
 9. Copperhill Mining and Reclamation Area. \$3.00
 10. Coweeta Hydrological Laboratory. \$5.00

GENETICS SYMPOSIUM AT THE ANNUAL MEETING

A genetics symposium will be held in conjunction with the 1981 meeting of the Association of Southeastern Biologists. The format will be similar to that of the genetics symposium that was held at the 1977 ASB meeting in Raleigh, North Carolina. The subject of the symposium is tentatively "Chromosome Structure and Function." There will be a series of invited papers on Thursday and Friday. These will be timed so as not to conflict with the genetics and cytology paper session. More information will be forthcoming in the January bulletin.

DENDROCHRONOLOGY MEETING

An Eastern U.S. Tree-ring paper session and field trip is being planned in conjunction with the ASB Annual Meeting in Knoxville. This gathering will not only be the first for ASB but for eastern dendrochronologists as well. A partial list of participants includes: Dr. T. J. Blasing, ORNL; Dr. R. L. Phipps, USGS Tree-Ring Laboratory; and Dr. Frank W. Woods, Department of Forestry, University of Tennessee. Additional information may be requested from Dr. F. W. Woods, University of Tennessee, P.O. Box 1071, Knoxville, TN 37901.

CHANGE OF ADDRESS

It is your responsibility to notify the ASB when you have a change of address. Please make the change several months in advance since the Post Office charges ASB for first-class postage on returned mail. Send your new address to: Ms. Dorothy Hubbard, The Academy of Natural Sciences, 19th and the Parkway, Philadelphia, PA 19103.

News of Biology in the Southeast

JON R. FORTMAN — *News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE

University of South Alabama, Department of Biological Sciences. **Dr. John Alan Freeman** has been appointed to the faculty effective September, 1980 as an Assistant Professor.

University of Alabama in Huntsville, Department of Biology. Two biologists will join the department this year: **Dr. Robert Lawton** (Ph.D., University of Chicago) will be an Assistant Professor of Biology with interests and responsibilities in botany and plant ecology. He replaces **Dr. K. P. Lewis** who resigned. **Dr. George Dimopoulos** (Ph.D. Michigan State University) will be a Professor of Biology with interests in immunology and biochemistry. **Dr. Dimopoulos** comes from Wright State University where he was Biology Department Chairman. He will be the new Dean of Science and Engineering replacing **Dr. J. Hoomani** who returned to the mathematics department. **Dr. Michael Eley** was recently tenured and promoted to the rank of Associate Professor of Biology. **Dr. Harold J. Wilson**, Associate Professor and Chairman of the Biology Department will be on a one year sabbatical leave at the University of Illinois in Urbana-Champaign for the 1980-81 academic year and summer. **Dr. Sam Campbell**, Associate Professor, will be acting chairman during the interim period. **Drs. Richard Modlin** and **J. Milton Harris** of the biology and chemistry departments, respectively, are presently working on a project funded by TVA to study the effects of 2,4-D and its metabolites after long term use as an aquatic herbicide.

Columbus College, Department of Biology. **William C. LeNoir, Jr.**, Professor of Botany and Chairman of the Division of Science and Mathematics has served as the Acting President of Columbus College from 1 January through 15 August 1980. **George E. Stanton**, Professor of Biology, has served as Acting Chairperson of the Division during Professor LeNoir's tenure as Acting President. Professor Stanton and his spouse, **Susan Stanton**, were recently named as Danforth Associates. **Flora M. Clark**, Professor of Biology, **Drs. LeNoir** and **Stanton** have served since April 1979 as members of the Columbus College Presidential Search Advisory Committee, with Professor Stanton chairing the committee.

University of Miami, School of Marine and Atmospheric Science. **Dr. David H. Cushing** of the Ministry of Agriculture, Fisheries, and Food of the United Kingdom will receive the Rosenstiel Award in Oceanographic Science for 1980, **Dr. William W. Hay**, Dean of the

University of Miami's School of Marine and Atmospheric Science announced this week. **Dr. Cushing's** work in fisheries science, including productivity of the oceans, marine ecology, and acoustics techniques for fisheries surveys and biomass estimates has earned him the high esteem of marine scientists throughout the world. In the very vital study of stock and recruitment in fisheries, **Dr. Cushing's** contributions have been outstanding. The Rosenstiel Award, \$5000 and a handsome gold medal, will be presented in Miami in November, 1980. At that time, he will hold seminars for students and faculty and will give a special lecture that will be open to the public.

Louisiana State University, Department of Botany. **Dr. Michael W. Adams** has been appointed as an Assistant Professor in the newly created position for Genetics. **Dr. Adam's** dissertation research was completed under the direction of **Dr. N. W. Gillham** at Duke University. He completed a post-doctoral study on "Genetic and biochemical analysis of eukaryotic flagella structure and function" at the Rockefeller University in New York under the direction of **Dr. D. J. L. Luck**. Following his work in New York, he returned to Duke University where he was a Hargitt Fellow and Visiting Assistant Professor. **Mr. Garrie P. Landry** currently a Research Associate in the department of botany has completed his MS degree and has accepted a position as Instructor in the department of biology at the University of Southwestern Louisiana. **Dr. Michael T. Postek**, who recently completed his doctoral studies with **Dr. Shirley C. Tucker**, has been appointed as Visiting Assistant Professor for the 1980-81 academic year. **Mr. David E. Lemke**, a doctoral candidate in the laboratory of **Dr. Marshall C. Johnson**, University of Texas at Austin, has been appointed as a Visiting Instructor for the 1980-81 year.

Northwestern State University of Louisiana, Department of Biological Sciences. **Dr. Kenneth L. Williams** is working on a project for the U.S. Forest Service to determine species and populations of amphibians and reptiles in Kisatchie National Forest as part of a major service effort to ascertain the effects of cattle grazing. **Dr. Arthur Allen** is studying biocontrol of water hyacinths in north Louisiana. **Drs. Walter Holmes, Dick Stalling** and **Kenneth L. Williams** will be involved in a botanical collecting trip to Peru, a swamp rabbit population study, and a reptile and amphibian collecting trip to Honduras respectively.

University of Southwestern Louisiana, Department of Biology. **Clementina Castro**, from the Universidad

Nacional Autonoma in Mexico City studied in the department during the summer of 1980. She was trained in DNA-DNA molecular hybridization techniques by Associate Professor **Sydney P. Craig, III**. While in residence at U.S.L., Castro and Craig were successful in characterizing the organization of the genome of *Trypanosoma cruzi*, a parasitic protozoan responsible for Chaga's disease. They also completed a pilot study of deoxyribonucleotide sequence divergence between the DNA's from strains of trypanosomes collected in Mexico, Costa Rica, Venezuela, and Argentina. In September, Castro returned to Mexico where she is continuing her work under the direction of **Mario Castaneda**, Chairman of the Department of Developmental Biology at the Instituto de Investigaciones Biomedicas. **Ms. Ethelyn B. LaHaye** from Memphis, Tennessee has been appointed as an Instructor of Biology in the department. **Ms. Karen Fritze** of Florida State University has been appointed as an Instructor of Biology and Coordinator for Freshman Laboratories.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. **Dr. David Cook**, head of the GCRL microbiology section, **John Ogle** and **Dr. Edwin W. Cake, Jr.** are involved in a project to evaluate a new method for disinfecting water for use in oyster depurating plans. Dr. Cook explained that the new method utilizes a patented device which produces ozone and other activated oxygen molecules. Ozone kills bacteria in much the same way as chlorine does. Using this method, oysters will become free of pollution-indicator bacteria within approximately 48 hours. **Dr. E. W. Cake, Jr.** head of the GCRL oyster biology section, was elected to a third one-year term as secretary-treasurer of the National Shellfisheries Association at the 72nd annual meeting of the NSA and the Shellfish Institute of North America at Hyannis, MA. Dr. Cake presented a paper entitled "The Use of an Oyster Rack for Offbottom Containerized Relaying of Polluted Oysters in Mississippi Sound." The paper was based on the research of GCRL graduate student **John Supan** for his master's thesis. **Dr. Lionel N. Eleuterius**, head of the botany section, attended a barrier islands forum and workshop at Provincetown, MA. **Dr. Sally Richardson**, **Dr. Jerome Laroche**, and **Wayne Laroche** presented papers based on original research at the 60th annual meeting of the American Society of Ichthyologists and Herpetologists at Texas Christian University. **Dr. David W. Cook** was elected to a three-year term on the executive committee of the Tropical and Subtropical Fisheries Technological Conference of the Americas at its recent fifth annual meeting in Charleston, SC.

Pfeiffer College, Biology Department. **Dr. J. O. Manly** is retiring after 25 years service as Biology Head of the Division of Natural Sciences. **Dr. Steve C. Dial** has been appointed as head of the department.

Winthrop College, Department of Biology. **Dr. Richard Houk** (Ph.D. Florida State University) has returned to full time teaching and research after several years in

administration. Dr. Houk had served Winthrop as Vice Provost.

University of Virginia, Department of Biology. **Dr. Charles Emerson** received appointment as Editor of "Developmental Biology" starting in October of 1980. **Dr. James Riopel** reports one of the most successful summers for the Mt. Lake Biological Field Station (Virginia). The station was filled to capacity with a great variety of biology courses offered. **Dr. Robert Kretsinger** was appointed to the Space Science Board starting July 1, 1980 to June 30, 1983. **Dr. Oscar Miller** was a recipient of the Senior U.S. Scientist Award (Alexander von Humboldt Foundation) for the period May 1, 1980 to December 30, 1980. Dr. Miller is enjoying the culture of Germany while presenting many seminars at a number of universities and research facilities concerning his work on ultrastructural aspects of genetic activity. He also plans to participate in two international meetings, the European Molecular Biology Organization Workshop on Messenger RNA in Arolla, Switzerland, and the Second International Congress on Cell Biology which takes place in early September in Berlin. **Dr. Paul Adler** was the recipient of an NIH Research Career Development Award. The department is pleased to have five new faculty members join this fall: **Dr. Arthur Bulger**, **Dr. Daniel Hornback**, **Dr. Pamela McMahan**, **Dr. Richard Roth** and **Dr. Steven Wasserman**. **Dr. Maureen Hanson** has been appointed editor for the 1980-81 year for the "Plant Molecular Biology Newsletter."

Murray State University. **Dr. Don Johnson**, Director of Hancock Biological Station, visited several laboratories in India during April and May. Discussions concerned fisheries and water quality as well as, how collaborative efforts might be initiated. The trip was funded by the NSF U.S.-India Exchange of Scientists program. Representatives of interested institutions will meet at the Station, October 17 and 18 to finalize plans for a regional consortium centered around Station and LBL resources. Experimental Ecological Reserve status and Tennessee Tombigbee ramifications will also be discussed at these meetings. Aquatic and parasitology research at the Station continues to expand with new projects on paddlefish, tilapia, and mussel culture underway.

North Carolina State University, Botany Department. **Dr. Tadanori Fukuda** has been appointed Visiting Associate Professor to work in the Cell and Tissue Culture Laboratory for a period of 10 months (June 1, 1980-March 1, 1981). Dr. Fukuda was awarded a grant from Japan's Ministry of Education. **Dr. Dennis Knight**, an ecologist, on sabbatical leave from the University of Wyoming, will be in residence for the 1980-81 academic year. Support is from NSF. **Dr. Laura Meagher** has been appointed Visiting Assistant Professor for 6 months (August 1, 1980-January 31, 1981) to work on the project "Molecular Biology as Applied to Agriculture and Forestry" with support from the North Carolina Board of Science and Technology.

North Carolina State University, Zoology Department. New appointments to the department include: **Dr. Gary J. San Julian**, Wildlife and Extension Specialist and Assistant Professor; **Dr. Patricia A. Noden**, Visiting Assistant Professor in Physiology; **Dr. Joseph M. Wunderle, Jr.** Visiting Assistant Professor in Ornithology. **Dr. Thomas L. Quay** retired from the department on July 1, 1980. He has been appointed a Professor Emeritus of Zoology. During his retirement he will be employed part-time at the N.C. Natural History Museum where he will have editorial and curatorial duties.

East Tennessee State University, Department of Biology. **Dr. Diane R. Nelson** was re-elected Secretary of the Tennessee Academy of Science at the annual meeting.

Vanderbilt University, Department of General Biology. **Drs. Terry L. Page** (Ph.D., University of Texas) and **David E. McCauley** have joined the faculty. Dr. Page was Research Associate at Hopkins Marine Station (Stanford University) where his major interest was in the study of circadian rhythms. Dr. McCauley was Research Associate at the University of Chicago where his major interest was population genetics. Both have been appointed as Assistant Professors. **Dr. William G. Eickmeier** has received a grant to study photosynthetic recovery in resurrection plants.

West Virginia University, Department of Biology. **Dr. W. V. Dashek** participated in an NIEHS/EPA sponsored workshop on pollen systems to detect biological activity of environmental pollutants at the University of Tennessee. He presented a paper on "The Use of Lily Pollen Germination and Tube Elongation as a Bioassay for the Hepatocarcinogen, Aflatoxin B1 and its relatives." He also participated in the 6th International Symposium on Recent Advances in Cytophysiology of Higher Plant Reproduction held in Lublin, Poland, where he presented two papers. He also presented a seminar on "Aflatoxins and Plants" to the Institute of Soil Science and Plant Cultivation at Pulawy, Poland.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Emory Museum, Emory University. Several hundred bird skins and folded insects were transferred to Fernbank Childrens Museum due to lack of space on the Emory campus. Expeditions are planned for 1981-82 for research in the Moabite region of Jordan.

Brookgreen Gardens, Murrells Inlet, South Carolina. Since 1975 Brookgreen Gardens has undertaken a major operation to transfer its native wildlife collection from a traditional zoo to a natural habitat area covering forty acres. Current permanent exhibits include the ninety-foot tall Cypress Bird Sanctuary, the only aviary of its type, which covers a portion of a cypress swamp and houses various species of native waterfowl. The Deer and Turkey Savannah comprised of twenty-two acres and the Otter Pond and Alligator Swamp have been well received by visitors, affording them a close look at these

elusive creatures. Eight circular enclosures create temporary exhibits for skunks, foxes, owls, opossums, hawks, raccoons, and bobcats. The entire area is delineated by finely-crushed stone paths and discrete directional signs, and each exhibit and many of the plantings bear interpretative signs or labels. The main feature of the Wildlife Park is its combination of local plants, animals and sculpture into an harmonious whole; the creations of nature and man side by side.

ABOUT INSTITUTIONS

Memphis State University hosts Joint Herpetology Meeting. The 1981 joint annual meeting of The Society for the Study of Amphibians and Reptiles and The Herpetologists' League will be held on the campus of Memphis State University during 9-14 August 1981. More information can be obtained by contacting *Dr. James S. Jacob*, Department of Biology, Memphis State University, Memphis, Tennessee 38152.

Columbus College, Department of Biology. Columbus College is implementing a new curriculum leading to the baccalaureate degree. The new program includes the expansions of genetics, physiology and ecology from 5 to 7 credit courses. Genetics and ecology have been spread over two quarters. In addition, requirements also include developmental biology, microbiology and evolution.

Murray State University, Hancock Biological Station. Representatives of more than 17 biology departments gathered at Hancock Biological Station on Kentucky Lake on October 17 and 18, 1979 to work out the details of the formation of an educational/research consortium around the facilities of the Biological Station and adjacent resources of the Land Between the Lakes and the Lake Barkley/Kentucky Lake complex.

Department of Botany, Louisiana State University. In cooperation with the Departments of Microbiology and Zoology/Physiology, a JEOL 100-CX transmission electron microscope with goniometer stage has been purchased.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. Belmont College of Nashville, Tennessee has been approved as an affiliate with the Research Laboratory for the purpose of teaching the marine sciences to Belmont students.

Warren Wilson College, Biology Department. Warren Wilson College is searching for a professional horticulturalist to teach in the Environmental Studies program and have a joint appointment in biology. This individual would develop a laboratory course in apiculture in addition to normal teaching duties, as well as develop a commercial apiary and expand the strawberry and blueberry production.

INDEX OF CURRENT PLANT SYSTEMATICS AND ECOLOGICAL RESEARCH IN THE SOUTHEASTERN UNITED STATES

This Index is patterned after the ASPT Index last published in 1970, and the FNA Index published in 1973. It is intended to update these lists for the ASB area. This project was established by members of the SABC and SE-BSA at the 1979 ASB meeting to serve as a clearinghouse of research projects in plant systematics and ecology. Cards were mailed to over 100 institutions requesting registrations. Below are the results of the first year of registry. With publication in the fall, the Index should be useful as new research projects are planned in the new academic year. Locality abbreviations follow those in Index Herbariorum Ed. 6. I would like to be informed of any errors. A new supply of cards will be mailed after January 1, 1981. Dr. James F. Matthews, Dept. of Biology, Univ. of N. C., Charlotte, NC 28223.

ALGAE

- Caulerpa* spp. — chemical analysis, S. Vest, USF.
GRACILARIACEAE — physiology, A. E. Gluck, USF.
Phytoplankton of Dismal Swamp, Lake Drummond —
population, ecology, H. G. Marshall, ODU.

FUNGI

- POLYSTIGMATACEAE — ascus cytology and sporogenesis, H. R. Mainwaring, WCUH.

BRYOPHYTES

- Moss flora of the Gulf Coast, W. D. Reese, USLH.
Bryophyte flora of Piedmont, S.C., C. C. Douglas, CLEMS.

PTERIDOPHYTES

- ASPIDIACEAE
Dryopteris — spore biology, L. J. Musselman, ODU.
CYATHEACEAE — flavonoids survey, J. W. Wallace, WCUH.
GLEICHENIACEAE — chemotaxonomic, J. W. Wallace, WCUH.
HYMENOPHYLLACEAE — chemotaxonomic, J. W. Wallace, WCUH.
OPHIOGLOSSACEAE — monographic, R. D. Thomas, NLU.
Ophioglossum — biosystematics and floristic, W. R. Faircloth, VSC.

PTERIDACEAE

- Pellaea wrightiana* — species biology, J. F. Matthews, UNCC.

SPERMATOPHYTES

- ACANTHACEAE
Odontonema — revision, V. M. Baum, MARY.
ALISMACEAE
Sagittaria — systematic, J. W. Wooten, U. of So. Miss., Hattiesburg, MS.
Sagittaria fasciculata — autecology, M. G. Douglass, CLEMS.
AMARANTHACEAE
Amaranthus hybridus/retroflexus — variation, distribution, identification, J. C. Murphy, NCSC.
APOCYNACEAE
Forsteronia, *Mandevilla* — systematics, revision, B. F. Hansen, USF.

- AQUIFOLIACEAE — All genera, world-wide, T. R. Dudley, MA.

- Family — taxonomy and distribution, SE, USA, R. C. Clark, MOR.

ARACEAE

- Arisaema triphyllum* — biosystematics, M. Treiber, NCU.

- Arisaema dracontium* — biosystematics, M. Treiber, NCU.

- ARECAEAE — Arecoid Palms — systematics and anatomy, B. E. Young, USF.

ASCLEPIADACEAE

- Matelea* — biosystematics, distribution, D. J. Drapalik, GAS.

- ASTERACEAE — Eupatorieae, Cynareae — floristic, M. F. Johnson, VCU.

- Aster*, Sect. *Patentes* — revision, R. L. Jones, VDB.
Bidens, section *Heterodonta* — revision, biosystematic, N. L. Wilson, MARY.

- Coreopsis* — biosystematic and chemosystemic, E. B. Smith, UARK.

- Eupatorium* and *Vernonia* — biosystematics, K. Gregg, WVW.

- Euthamia* — revision, D. J. Sieren, WNC.

- Heterotheca subaxillaris* — population ecology, R. R. Sharitz, Savannah River Ecol. Lab., Aiken, S.C.

- Liatris*, series *Graminifoliae* — revision, monograph, T. A. Atkinson, NCU.

BERBERIDACEAE

- Caulophyllum thalictroides* — biosystematic, J. F. Brett, OAC.

BETULACEAE

- Betula lenta*, *B. lutea*, *B. uber* — flavonoid chemotaxonomy, S. K. Gerbeth, NCU.

- CAESALPINIACEAE — Genera of SE U.S. — embryological, J. Benson, USCH.

- CAMPANULACEAE — (particularly *Campanula*) — biosystematics, S. G. Shetler, US.

CAPRIFOLIACEAE

- Viburnum* — worldwide, T. R. Dudley, NA.

- Viburnum* (sect. *Lentago*) — revision, T. H. Jones, NCSC.
- CHENOPODIACEAE**
Atriplex patula — seed selection, G. F. Somers and J. L. Gallagher, DELS.
- COMMELINACEAE**
Tradescantia series *Virginiana* — systematic, D. T. MacRoberts, LSUS.
- CONVOLVULACEAE**
Ipomoea spp. in NC and SC — reproduction, pollination biology, R. L. Beckmann and J. M. Stucky, NCSC.
- CRASSULACEAE**
Sedum, sect. *Ternata* — biosystematics, flavonoids, SEM, P. J. Calie, TENN.
- CYPERACEAE**
Carex — leaf anatomy, numerical taxonomy, M. R. Mallory, MUHW.
Carex and *Cyperus* — biosystematics, revision, D. K. Evans, MUHW.
Carex albolutescens — biosystematic, P. E. Rothrock, Montreat-Anderson College, Montreat, NC.
Cyperus — morphological, numerical analysis, J. R. Taylor, MUHW.
Cyperus — monographic, floristic, J. W. Thieret, KNK.
Cyperus ovularis complex — revision, R. Carter, VDB.
Fuirena, *Fimbristylis*, *Bulbostylis* *Abildgaardia* — revision, R. Kral, VDB.
Rhynchospora — revision, S. M. Kooijman, FLAS.
Scleria, SE U.S. — monographic, floristic, J. E. Fahey, III, CLEMS.
- ERICACEAE**
Elliottia racemosa — biosystematics, reproductive biology, D. J. Drapalik, GAS.
Lyonia, *Pieris*, *Agarista*, *Craibiodendron* — monographic, W. S. Judd, FLAS.
Rhododendron, lepidote spp. — taxonomic revision, W. H. Gensel, NCSC.
Vaccinium complex, coastal plain — biosystematic, W. H. Cribbs, VSC.
- EUPHORBIACEAE** — Euphorbiaceae of Florida Keys — biosystematic, anatomy, W. J. Hayden, MARY.
- FABACEAE** — Cercideae — monographic, R. P. Wunderlin, USF.
Papilionaceous genera in SE U.S. — Embryology, R. George, USCH.
Calliandra — chemical systematics and ecology, J. T. Romeo, USF.
Galactia — floristic, D. W. Hall, FLAS.
Phaseolus lunatus — pollination ecology, S. D. Hight, MARY.
- FAGACEAE**
Quercus spp. — hardwood regeneration and fire, M. Teuke, CLEMS.
- Quercus rubra*, *Q. velutina*, *Q. coccinea* — variability and hybridization, M. Baranski, Catawba College, Salisbury, N.C.
Quercus oglethorpensis — taxonomy, ecology, rep. biology, G. Haehnle, CLEMS.
Quercus rubra — flavonoids, K. M. McDougal, NCU.
- GERANIACEAE** —
Geranium carolinianum, species complex — biosystematic, F. M. Heller, MARY.
- GROSSULARIACEAE**
Grossularia — revision, Q. P. Sinnott, MARY.
- HYDROCHARITACEAE** — **POTAMOGETONACEAE** — Family survey — chemical, histochemical, C. Dawes, USF.
- LAMIACEAE** — Family — Taxonomic, monographic, SE, U.S., J. L. Collins, TVA, Land and Forest Resources, Norris, TN.
Dicerandra — taxonomic, R. B. Huck, NCU.
Synandra hispidula — species biology, M. A. Burdette, MUHW.
- LILIACEAE**
Alettris — biosystematic, P. L. Risk, NCU.
Smilax, US species — biosystematic, G. A. Wallace, CLEMS.
- MAGNOLIACEAE**
Liriodendron — bibliographic, R. E. Schoenike, CLEMS.
- MALVACEAE**
Kosteletskyia virginica — seed selection, G. F. Somers and J. Gallagher, DELS.
- MELASTOMATACEAE**
Miconia — monographic, W. S. Judd, FLAS.
- OLEACEAE**
Fraxinus americana — sex determination in seedlings, R. L. Beckmann, Jr., NCSC.
Fraxinus americana — chemotaxonomic, C. Black, NCSC.
- ONAGRACEAE**
Ludwigia — population ecology, R. E. Wilcox and C. A. McCaffrey, Savannah River Ecol. Lab., Aiken, S.C.
Oenothera, *Ludwigia*, *Epilobium*, *Gaura*, *Circaea* — embryological, J. M. Herr, Jr., USCH.
- ORCHIDACEAE** — *Spiranthinae* — biosystematic, P. Balogh, MARY.
Catasetum and *Cynoches* — physiology of sex expression, K. Gregg, WVW.
Cynoches — systematic study of odors and lip morphology, K. Gregg, WVW.
Isotria — reproductive biology and population biology, L. A. Mehrhoff, III, NCU.
Platanthera ciliaris — developmental, S. D. Zaret, MARY.
- PINACEAE**
Pinus — natural hybridization, biosystematics, R. E. Schoenike, CLEMS.

- Pinus palustris* — elemental cycling, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
- Pinus taeda* — plutonium contaminant cycling, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
- PIPERACEAE — Ecological — sixteen species in Ecuador, J. B. Watson, USF.
- POACEAE
- Andropogon, Schizachyrium* — revision, H. R. Deselm, TENN.
- Spartina alterniflora, S. patens, Distichlis spicata, Sporobolus virginicus* — salt tolerance, edibility, G. F. Somers, J. L. Gallagher, DELS.
- POLYGALACEAE
- Polygala* — morphology, taxonomy, SEM, J. Massey, J. Hardin, NCU.
- RANUNCULACEAE — Floristics of Virginia species, G. W. Ramsey, LYN.
- Genera — evolutionary relationships, G. S. Van Horn, UCHT.
- Cimicifuga* — biosystematics, monographic, G. W. Ramsey, LYN.
- ROSACEAE
- Aruncus dioicus* — species biology, T. L. Mellichamp, UNCC.
- Waldsteinia lobata* — distribution and ecology, C. C. Douglas, CLEMS.
- SANTALACEAE
- Nestronia umbellula* — pollination and reproduction biology, T. L. Mellichamp, UNCC.
- SAXIFRAGACEAE
- Astilbe biternata* — species biology, T. L. Mellichamp, UNCC.
- Heuchera* — monograph, revision, H. G. Bedell, MARY.
- Hydrangea arborescens* complex — taxonomic revision, R. E. Pilatowski, NCSC.
- Saxifraga careyana, S. caroliniana* — taxonomic revision, M. R. Weber, NCSC.
- SCROPHULARIACEAE — All Genera, monographic, floristic, J. W. Thieret, KNK.
- All species — floristic, L. A., K. A. Vincent, USLH.
- Aureolaria* — monographic, J. L. Collins, TVA Land and Forest Resources, Norris, TN.
- TAXODIACEAE — Ecology of Cypress Swamp forests, W. A. Pepaske and H. S. Neufeld, Savannah River Ecol. Lab., Aiken, SC.
- Physiological ecology of Cypress in relation to inundation and thermal effluents, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
- Taxodium* — revision, F. D. Watson, NCSC.
- Taxodium distichum, T. ascendens* — comparative physiological ecology, H. S. Neufeld, GA.
- THEACEAE
- Camellia* — isozymes, taxonomy, and evolution, J. F. F. Wendel, NCU.
- Gordonia lasianthus* — ecology, phenology, C. A. Gresham, Baruch Forest Science Institute, Georgetown, SC.
- TILIACEAE — All Genera — neotropics, taxonomic revision, W. Meijer, KY.
- TYPHACEAE
- Typha* — population ecology, genetics, R. R. Sharitz, Savannah River Ecol. Lab., Aiken, SC.
- VALERIANACEAE
- Valerianella* — revision, biosystematic, D. E. Ware, WILLI.
- XYRIDACEAE — All species — revision, R. Kral, VDB.
- MULTIFAMILY STUDIES
- Chemical components of *Brasenia schreberi*, and *Nelumbo lutea*, J. W. Wooten, Univ. of Southern Mississippi, Hattiesburg, MS.
- Medicinal vascular plants used by the Lumbee Indians, E. M. Croom, Jr., NCSC.
- SEM study of leaf surface features and trichomes, J. W. Hardin, NCSC.
- Species biology of endangered and threatened plants, J. R. Massey, NCU.
- GENERAL
- A study of endangered species programs in North American botanical gardens. B. Brumback, DELS.
- FLORA
- ALABAMA
- (Al-mid. TN) Manual of vascular flora, R. Kral, VDB.
- ARKANSAS
- Grass flora of Arkansas, A. Sherif, UARK.
- Flora of Arkansas, E. B. Smith, UARK.
- Vascular flora of Carroll Co., R. Noble, UARK.
- Vascular flora of St. Francis Co., F. Deneke, Memphis St. Univ., Memphis, TN.
- DISTRICT OF COLUMBIA
- Flora — revision of old D.C. flora, S. G. Shetler, US.
- FLORIDA
- Flora of Florida, D. Hall, W. Judd, FLAS.
- Grass flora of coastal plain of Florida, D. W. Hall, FLAS.
- Vascular epiphytes of Florida, J. B. Watson, USF.
- Vascular plants of San Felasco Hammock State Preserve, W. J. Dunn, FLAS.
- GEORGIA
- Checklist and atlas of vascular plants of Georgia, N. C. Coile, GA.
- Flora of Cumberland Plateau, Georgia, S. B. Jones, GA.
- Flora of Hard Labor Creek State Park, L. Hill, GA.
- Flora of Okefenokee Swamp, S. B. Jones, GA.
- Vascular plants of coastal plain of Georgia, W. R. Faircloth, VSC.
- KENTUCKY
- Floristics of Kentucky, J. W. Thieret, KNK.
- Floristics of Kentucky, W. Meijer, KY.

LOUISIANA

Atlas of vascular flora of Louisiana, R. D. Thomas, NLU.

Checklist of vascular plants of Louisiana, R. D. Thomas, NLU.

Checklist of vascular plants of DeSoto Parish, D. Dixon, NLU.

Checklist of vascular plants of East Carroll Parish, J. McCoy, NLU.

Checklist of vascular plants of Madison Parish, N. Rich, NLU.

Checklist of vascular plants of Sabine Parish, N. Carroll, NLU.

Checklist of vascular plants of Winn Parish, R. Hutchinson, NLU.

Flora of Louisiana, J. W. Thieret, KNK.

Shrubs and woody vines of Louisiana, T. Briley, NLU.

Vascular plants of Claiborne Parish, L. Lewis, NLU.

NEW YORK

Flora of Long Island, R. Stalter, St. John's Univ., Jamaica, N.Y.

NORTH CAROLINA

Floristics and vegetation studies of Rowan and adjacent counties, M. J. Baranski, Catawba College, Salisbury, NC

Spring flora of coastal plain, D. J. Sieren, WNC.

Vascular flora of Mecklenburg Co., J. F. Matthews, UNCC.

Vascular plants of southeastern NC., D. J. Sieren, WNC.

SOUTH CAROLINA

Flora of Burns Islands, SC., R. Stalter, St. John's Univ., Jamaica, NY.

Survey of vascular plants of Beidler Forest in Four Holes Swamp, R. Porcher, CITA.

Threatened and endangered vascular plants of the Francis Marion National Forest, R. Porcher, CITA.

TENNESSEE

Vascular flora of Lauderdale Co., E. T. Browne, Memphis St. Univ., Memphis, TN.

VIRGINIA

Vascular plants of SE Virginia and NE North Carolina, L. J. Musselman, ODU.

Vascular flora of southern Piedmont Virginia and the Central Blue Ridge Mts., G. W. Ramsey, LYN.

Vascular flora of Mathews Co., M. Van Montfrans, WILLI.

Vascular flora of the peninsula of Virginia, D. M. Ware, WILLI.

SOUTHEAST UNITED STATES

Flora of barrens and glades of the southeast, H. R. DeSelm, TENN.

Southeastern Flora, J. R. Massey, NCU.

Flora of the southern Appalachian Mountains, J. H. Horton, R. Clark, L. Collins, J. Hardin, J.

Massey, J. Matthews, L. Mellichamp, D. Porter, E. Wofford, WCUH, et al.

ECOLOGY

FLORIDA

Sandpine scrubs, oak-pine — sandhills, G. B. Williamson, USF.

Quercus virginiana — *Sabal palmetto* communities, R. Stalter, St. John's Univ., Jamaica, NY.

MARYLAND

Seed bank, aquatic and terrestrial, D. Mason, MARY.

Seed bank, population ecology of climax forest and old field, D. W. Bigwood, MARY.

NORTH CAROLINA

Effects of fire on *Lonicera japonica*, L. S. Barden, UNCC.

Succession in doline pond vegetation, D. M. Dumond, WNC.

Population biology of rare and endangered plants, R. D. Sutter, Dept. of Agric., Raleigh, NC.

Composition, succession, productivity and diversity of forest communities, R. K. Peet, NCU.

Demography and life history characteristics of forest tree populations, R. K. Peet, NCU.

Fog, ecological importance in high summits and gaps, G. Smathers, WCUH.

Community ecology of spruce — fir, heath, grass associations, J. H. Sullivan, WCUH.

Spruce — fir origin, development and maintenance, G. Smathers, P. Saunders, G. Ramseur, WCUH.

Community structure and dominance in mountain vegetation, G. A. Smathers and J. D. Pittillo, WCUH.

Phytosociology of gnarled red oak communities along Blue Ridge Pky., G. Smathers and J. Horton, WCUH.

SOUTH CAROLINA

Secondary forest succession, C. A. Gresham, Baruch Forest Science Institute, Georgetown, SC.

Nutrient cycling with whole tree harvesting, D. H. Van Lear and J. Waide, CLEMS.

Nutrient cycling, prescribed burning in loblolly pines, J. Douglass and D. H. Van Lear, Coweeta Hydrologic Lab., Franklin, NC and CLEMS.

Community analysis of forest communities at Savannah River Plant, D. H. Van Lear, CLEMS.

SOUTH CAROLINA

Community analysis of lowland hardwood forests, R. H. Jones, CLEMS.

TENNESSEE

Revegetation system for disturbed sites, R. E. Farmer, TVA Land and Forest Resources, Norris, TN.

Tree species replacement in old growth forests, TENN, L. S. Barden, UNCC.

Community Ordination, J. Eaton, Tennessee Tech. Univ., Cookeville, TN.

Analysis of plant communities, H. R. DeSelm,
TENN.

Effects of powerline construction and maintenance
on cedar glades, J. L. Collins, TVA Land and
Forest Resources, Norris, TN.

VIRGINIA

Composition and succession in past-chestnut upland
forests, G. Johnson and D. Blackman, WILLI.

Composition, succession, controlling factors of up-
land hardwood forests, S. Ware, WILLI.

Community and ecosystem ecology in swamp for-
ests, F. P. Day, ODU.

EASTERN UNITED STATES

Substrates and competition of rock outcrop commu-
nities, S. Ware, WILLI.

SOUTHEASTERN UNITED STATES

Autecology of *Pinus glabra*, R. Stalter, St. Johns
Univ., Jamaica, NY.

Endangered/threatened species of TVA areas, J. L.
Collins, TVA Land and Forest Resources, Nor-
ris, TN.

Autecology of parasitic and semiparasitic angio-
sperm families, L. J. Musselman, ODU.

Biomass, caloric content, productivity of aquatic
vascular plants, J. W. Wooten, Univ. of So.
Miss., Hattiesburg, MS.

U.S. POSTAL SERVICE STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685)			
1. TITLE OF PUBLICATION The ASB Bulletin (ISSN 0001-2386)		2. PUBLICATION NO. 10 13 2 0	
3. FREQUENCY OF ISSUES Quarterly (January, April, July and October)		4. ANNUAL SUBSCRIPTION PRICE \$10.00	
5. LOCATION OF HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Do not print) University of Alabama, P.O. Box 1997, University, AL 35886, J. C. O'Kelley (Treasurer)			
6. NAMES AND COMPLETE ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR			
PUBLISHER (Name and Address) Academy of Natural Sciences, 19th and The Parkway, Philadelphia, PA 19103			
EDITOR (Name and Address) James W. Martin, Dept. of Botany, North Carolina State University, Raleigh, NC 27650			
MANAGING EDITOR (Name and Address) None			
7. OWNERS (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.)			
NAME ADDRESS Association of Southeastern Biologists, Inc. Chapel Hill, NC (Dr. William J. Koch, Associate Professor, Dept. of Botany, University of North Carolina, Apex)			
8. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES (If there are none, so state)			
NAME ADDRESS None			
9. FOR COMPLETION BY NONPROFIT ORGANIZATIONS AUTHORIZED TO MAIL AT SPECIAL RATES (Section 132.122, PSN) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one)			
☒ HAVE NOT CHANGED DURING PRECEDING 12 MONTHS ☐ HAVE CHANGED DURING PRECEDING 12 MONTHS (If changed, publisher must submit explanation of change with this statement)			
10. EXTENT AND NATURE OF CIRCULATION		AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	
A. TOTAL NO. COPIES PRINTED (Net Print Run)		1575	
B. PAID CIRCULATION 1. SALES THROUGH DEALERS AND CARRIERS, STREET VENDORS AND COUNTER SALES		none	
2. MAIL SUBSCRIPTIONS		1400	
C. TOTAL PAID CIRCULATION (Sum of B1 and B2)		1400	
D. FREE DISTRIBUTION BY MAIL, CARRIER OR OTHER MEANS SAMPLES, COMPLIMENTARY, AND OTHER FREE COPIES		100	
E. TOTAL DISTRIBUTION (Sum of C and D)		1500	
F. COPIES NOT DISTRIBUTED 1. OFFICE USE, LEFT OVER, UNACCOUNTED, SPOILED AFTER PRINTING		75	
2. RETURNS FROM NEWS AGENTS		none	
G. TOTAL (Sum of E, F1 and F2—should equal net press run shown in 4)		1575	
11. I certify that the statements made by me above are correct and complete		SIGNATURE AND TITLE OF EDITOR, PUBLISHER, BUSINESS MANAGER, OR OWNER <i>Rorothy J. Hublanc, Circulating Manager</i>	
12. FOR COMPLETION BY PUBLISHERS MAILING AT THE REGULAR RATES (Section 132.121, Postal Service Manual)			
39 U.S.C. 3626 provides in pertinent part: No person who would have been entitled to mail matter under former section 4359 of this title shall mail such matter at the rates provided under this subsection unless he files annually with the Postal Service a written request for permission to mail matter at such rates. In accordance with the provisions of this statute, I hereby request permission to mail the publication named in item 1 at the phased postage rates presently authorized by 39 U.S.C. 3626.			
SIGNATURE AND TITLE OF EDITOR, PUBLISHER, BUSINESS MANAGER, OR OWNER <i>Rorothy J. Hublanc, Circulating Manager</i>			



59.06

QH301
.A78
*

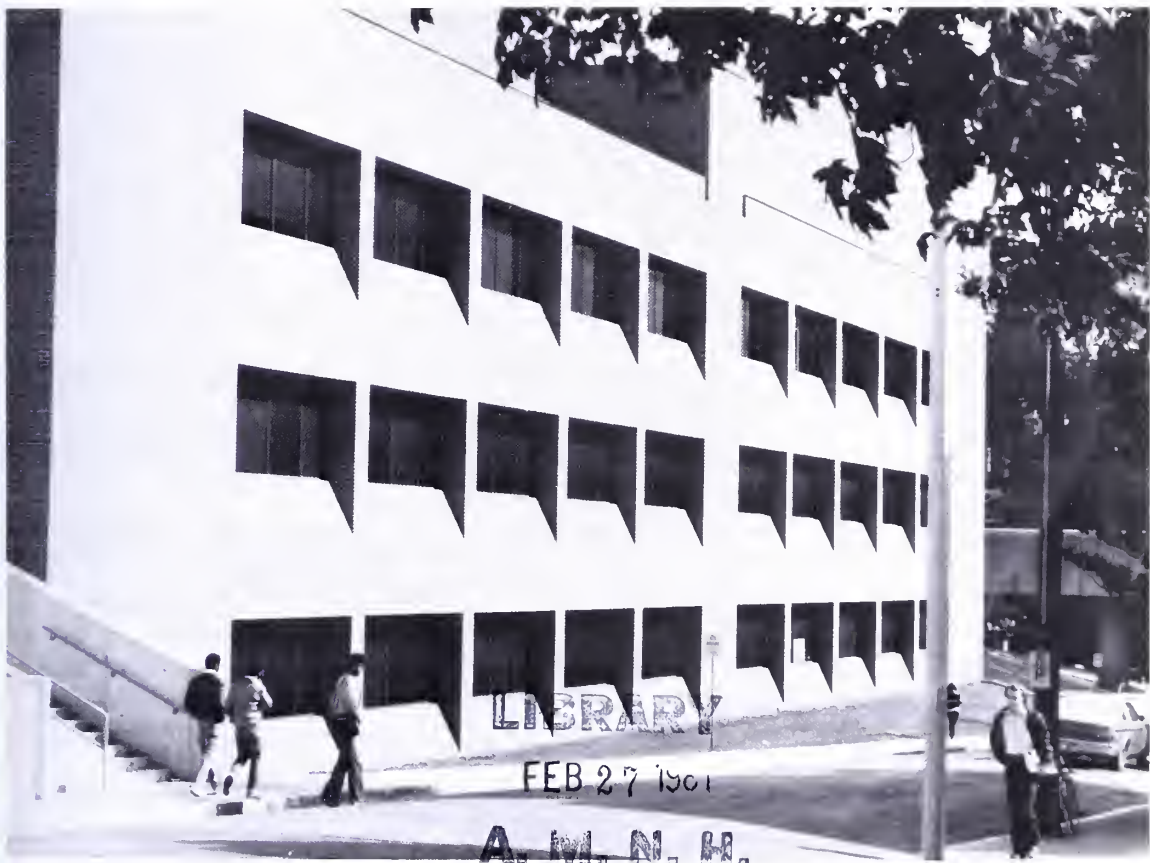
The ASB

BULLETIN

Volume 28, Number 1

(ISSN 0001-2386)

January 1981



*Walters Life Science Building
University of Tennessee*

***The Official Quarterly Publication of
The Association of Southeastern Biologists***

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

Past President — James W. Hardin, Botany, North Carolina State University, Raleigh, NC 27650

President Elect — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Vice-President — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbank, Box 15134, Atlanta, GA 30333

Executive Committee —

James L. Riopel (1981), Biology, University of Virginia, Charlottesville, VA 22901

Donald J. Shure (1981), Biology, Emory University, Atlanta, GA 30322

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Seawee, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

AAAS Representative, Section G — Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

About the Knoxville Meeting	3
Association Affairs	8
News of Biology in the Southeast	10

COVER

A campus scene showing the new Walters Life Science Building located near the University Center.

TIME AND PLACE OF FUTURE MEETINGS

1981	April 8-11	University of Tennessee, Knoxville
1982	April 14-17	Eastern Kentucky University, Richmond
1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984		Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Co., Greenville, SC



ABOUT THE KNOXVILLE MEETING

The Association of Southeastern Biologists will hold its 42nd Annual Meeting April 8–10, 1981 at The University of Tennessee in Knoxville. Wednesday evening registration and Wednesday, Thursday, and Friday evening socials will be held at the Campus Sheraton Inn. Other activities, including Thursday registration, exhibits, most paper sessions, Thursday night feature address, Friday night banquet, Retiring President's address, and announcements of awards and new officers will be in the University Center.

The University of Tennessee encourages all ASB members and friends to attend the meetings, to visit the new Walters Life Science Building, and to preview the 1982 Worlds Fair and Energy Exposition.

In order to provide the finest services and facilities at the lowest possible cost, ASB members are requested to **PRE-REGISTER** for the 1981 meeting according to instructions provided earlier in the October issue of the Bulletin, and again in this issue.

Societies Meeting With ASB in Knoxville

Beta, Beta, Beta, Southeastern Region
Southeastern Division, American Society of Ichthyologists and Herpetologists

Southeastern Fishes Council

Southeastern Section, Botanical Society of America

Southeastern Chapter, Ecological Society of America

Southeastern Society of Parasitologists

Southern Appalachian Botanical Club

Knoxville and The University of Tennessee

Knoxville is located in the Tennessee Valley, at an altitude of 936 feet. The city is surrounded by five of the "Great Lakes of the South"—and lies in the shadows of both The Great Smoky Mountains National

Park and the Cumberland Mountains. A population of nearly 200,000 is extensively involved in the management and development of natural resources, especially for the production of energy. These programs are carried out through independent and cooperative projects at Oak Ridge National Laboratory, the Tennessee Valley Authority, the National Park Service, private industry and by the University of Tennessee. Following President Carter's invitation to the nations of the world to attend the International Energy Exposition and Worlds Fair in Knoxville, the city has emerged as America's Energy Capital. Knoxville is also well known for its Zoological Park, the annual Dogwood Arts Festival (April 10–26), mountain arts and crafts and historic sites.

The University of Tennessee was founded at Knoxville in 1794. In 1869 it was designated Tennessee's federal land grant institution and a decade later became the state university. Housed in 175 buildings throughout the 400 acre campus are 106 undergraduate and 280 graduate degree programs offered through 17 schools and colleges. Eight thousand of the approximately 30,000 students live on campus in one of 12 residential halls or married student apartments.

Graduate and undergraduate degrees in the biological sciences are offered in Biochemistry, Botany, Ecology, Microbiology, and Zoology. Related programs in applied biology are offered in departments of Animal Sciences, Forestry, Fisheries and Wildlife, Plant Sciences, Veterinary Medicine and Radiation Biology.

Travel Into Knoxville

Automobile: Upon receipt of pre-registration forms, the University of Tennessee Department of Conferences will mail to each individual a map of the city and cam-

pus. Because of extensive highway construction in preparation for the 1982 Worlds Fair, up to date maps will be very useful. Highway signs on Interstates 40 and 75 will direct traffic to the campus.

Air Service: Knoxville is served by regularly scheduled flights by Delta, United, Piedmont, Republic, American and TWA. Limousine service is available from the airport to campus. Rental cars are also available.

Bus Service: Greyhound (100 E Magnolia Avenue) and Trailways (315 W Main). Trailways is only a few blocks from campus.

Dining Facilities

Upon receipt of pre-registration forms, The University of Tennessee Department of Conferences will mail each registrant a current list of selected dining facilities on and off campus.

Local Alcohol Mores

Wide open, discretion advised.

Accommodations

No campus housing is available. It is advisable to make motel reservations by March 1st. Deadlines for accepting reservations at special conference rates are indicated for each motel. Please mention that you are attending the ASB meeting at UTK. The following motels have reserved rooms at reduced rates for the ASB meeting.

Sheraton Campus Inn 1706 Cumberland Av. SW Knoxville, Tn. 37916 (615) 524-4681 (1 block from UT Center)	single—\$25 double—\$30 + 9% tax + 35¢ Deadline 3/22
University Travel Inn 17th St. and Clinch Knoxville, Tn. 37916 (615) 546-5974 (2½ blocks from UT Center)	single—\$23 double—\$31 + \$5 each add. + 9% tax Deadline 3/24

Holiday Inn Downtown 1 Chapman Hwy. Knoxville, Tn. 37916 (615) 573-1921 (½ mile from UT Center)	single—\$24 double—\$30 + \$5 each add. + 9% tax Deadline 3/24
---	--

Holiday Inn University Center 621 Dale Ave. Knoxville, Tn. 37916 (615) 525-5371 (¾ mile from UT Center)	single—\$25 two bedded rooms; \$28 king double—\$32 two bedded rooms; \$35 king + 9% tax + \$4 each add. Deadline 3/9
---	---

Hyatt Regency 500 E. Hill Ave. Knoxville, Tn. 37916 (1 mile from UT Center)	single—\$39 double—\$46 + 9% tax Deadline 3/24
--	---

Howard Johnson, North 118 Merchants Rd., NW Knoxville, Tn. 37916 (615) 688-3141 (4 miles from UT)	single—\$23 double—\$28 3 people—\$32 4 people—\$36 + 9% tax Deadline 3/24
---	---

Howard Johnson, West 7723 Kingston Pike Knoxville, Tn. 37916 (615) 693-6111 (7 miles from UT)	single—\$23.50 double—\$32.00 + 9% tax Deadline 3/24
---	---

Cherry Tree Inn 1500 Cherry St. Knoxville, Tn. 37917 (615) 546-7110 (4 miles from UT)	single—\$22 double—\$25 + \$3 each add. + 9% tax Deadline 3/27
---	--

Camping facilities are available in The Great Smoky Mountains National Park (reservations recommended) and in private campgrounds in Townsend and Gatlinburg.

Pre-Registration and Registration

Pre-registration information and forms are provided with the October and January issues of the Bulletin. Pre-registration will enable us to provide facilities and services in the most efficient manner at the lowest cost. Late registration will be possible at the Campus Sheraton Inn on Wednesday from 5–9 P.M. and in room 239 of the University Center on Thursday from 8 A.M.–5 P.M. Registration fees will be the customary \$3.00 for students and \$5.00 for all others.

General Schedule

Wednesday: ● Ecological Society of America, SE section field trip—Vegetation, Soils and Geology of the Great Valley of Tennessee (William Martin, Eastern Kentucky University).

- Late registration (5–9 P.M.) and cash bar social (9–11 P.M.) Campus Sheraton Inn.

Thursday: ● Symposium—Ecosystems of the Southern Appalachian Highlands—Part I (8–11:30 A.M.).

- Symposium—Chromosome Structure and Function—Part I (1–4 P.M.).

- Paper sessions, exhibits, placement service and society luncheon meetings in the University Center.

- OPEN HOUSE AND TOUR—Biological Sciences facilities, including animal care facilities, EM facilities, instructional laboratories and supporting shop facilities (4–5 P.M.).

- General Session: Welcome to UTK and feature address. University Center 7:30 P.M. Speaker: Dr. Robert Moseley, Chairman, Department of Radiology. The University of New Mexico. Topic: "Acceptability of Radiation Risk."
- Social 9–11 P.M., Campus Sheraton Inn—Courtesy of Fisher Scientific Co.

Friday: ● Society and group breakfasts—University Center.

- Symposium—Ecosystems of the Southern Appalachian Highlands. Part II (8–11 A.M.).

- Symposium—Chromosome Structure and Function—Part II (1:30–5:00 P.M.).

- ASB Business Meeting (11:00–Noon).

- Paper Sessions, exhibits and placement service in the University Center.

- ASB Banquet, 7 P.M., University Center.

- Cash Bar Social—Campus Sheraton Inn 9–11 P.M.

Saturday: ● Executive Committee Breakfast 8:30 A.M.—Campus Sheraton Inn.

- Field Trips—Meet in front of Hesler Biology Building.

Local Points of Interest

Campus: ● Recently completed Walters Life Sciences Building.

- University Aquatic Center, indoor/outdoor Olympic pools.

- All weather Olympic track.

- Tennis stadium and courts.

- Carousel and Clarence Brown Theaters.

- McClung Museum.

Knoxville Area:

- U.T. Arboretum, Oak Ridge, Tn.

- American Museum of Science and Energy, Oak Ridge, Tn.

- Dogwood Arts Festival (April 10–26).

- The Great Smoky Mountains National Park, Cades Cove—A Living Museum.

- Gatlinburg and Pigeon Forge, family amusement centers (ASB discounts available upon request from University Department of Conferences).

- Knoxville Zoological Park.

- Westside Dinner Theater.

- Lost Sea—Cave and Underground Lake.
- Blount Mansion, built 1792.
- James White Fort.
- Dulin Gallery of Art.
- Energy Expo '82—Worlds Fair Site.

Phone Numbers of Interest (Area Code 615)

- Universal Emergency—911
- Tourist Information 523-2316
- Chamber of Commerce 637-4550
- Weather 573-8351
- Knoxvisit—for conventions and visitors 523-7263
- AAA Motor Club—637-1910
- Travelers Aid—522-8718

Local Arrangements Committee

Chairperson—Frank McCormick (974-3065)

Pre-registration and Registration—Jim Caponetti (974-2256)

Program—Hal DeSelm (974-2256)

Exhibits—Boyd Dearden (974-7129)

Field Trips—Clif Amundsen (974-3065)

Special Events—Ed Clebsch (974-2256)

Meeting Rooms and Audio Visual Aids—Sandy Echternacht (974-6041)

Banquet, meals, and social events—Gary Saylor (974-3065)

Field Trips: Saturday, October 11

Ten field trips are planned. If you plan to go on one of these, please indicate the number on your pre-registration form. If transportation is needed, add the amount per person to your pre-registration total. The amounts indicated may be readjusted at registration depending upon participation.

1. Aquatic Research Programs in the Great Smoky Mts. National Park.
2. Vegetation and Floristic Studies in the GSMNP.
3. Wildlife Management in the GSMNP.
4. Resource Management in the GSMNP.

(These 4 trips will be conducted by the Up-lands Research Lab. staff. Cost for transportation \$3.00.)

5. Natural History of the Great Smoky Mountains. Led by Dr. Ed Clebsch. \$3.00
6. Natural Resources Division of the Tennessee Valley Authority, Norris, Tn. \$3.00
7. Obed River National Wild and Scenic River Area in the Cumberland Mts. \$3.00
8. Oak Ridge National Laboratory—Environmental Sciences Division and Biology Division. \$3.00
9. Ocoee River—Copper Basin. Led by Drs. Amundsen and Heilman. \$3.00
10. Coweeta Hydrological Laboratory, U.S. Forest Service Research Station. Led by Dr. Swank. \$5.00

(Individual trips may be cancelled if there is insufficient interest.)

ASB PRE-REGISTRATION FOR KNOXVILLE MEETING

(type or print, one for each registrant)
(duplicate as needed)

Name

Institution

City State Zip

Check the following: Registration: Regular \$5.00 _____ Student \$3.00 _____

ASB Banquet: Faculty \$6.75 _____ Student \$5.00 _____

Ecology Lunch \$4.00 _____ Parasitology Lunch \$4.00 _____

Field trip No. _____ Transportation needed \$5.00 or \$3.00 _____

Send copy of this form and check by April 1st to: Department of Conferences,
University of Tennessee, 1629 Melrose Ave., Knoxville, TN 37916; or call
615/974-5261 if charge card is used.

ASSOCIATION AFFAIRS

CHANGES IN THE ASB BULLETIN

Beginning with this January 1981 issue, the ASB Bulletin reflects several changes—smaller page size, lighter-weight paper, a new printer and mailing procedure, and a relatively new editor. Hopefully these changes will result in greater economy and efficiency, and a continuation of the high quality of the past.

Those who have followed the Bulletin through the past 27 vols. have recognized several changes over the years. The first seven volumes were printed on an uncoated white paper which, at least in mine, has by now turned somewhat yellowish. Since January 1961 (Vol. 8, No. 1), the paper has been a 70 lb. enamel finish and the front cover has had a half-tone illustration. The text and cover will now be on 60 lb. coated paper. The trim size has consistently been $7\frac{1}{4} \times 10$ in. until the smaller size here— $6\frac{7}{8} \times 10$. There have been only four printers:

- 1954–59 Orange Printshop, Chapel Hill, NC
- 1959–61 Cary Printing Co., Columbia, SC
- 1961–65 Wickersham Printing Co., Lancaster, PA
- 1965–80 Fulton Press, Inc., Lancaster, PA

Beginning with this issue, we have a new printer, Allen Press, Inc., Lawrence, KS. Allen Press will also handle the mailing direct from Lawrence. The ASB is very grateful to the Fulton Press, and particularly to Mrs. Kathleen Phillips of that Press, for 15 years of faithful and excellent service. We now welcome Allen Press and look forward to a more economical, high quality publication.

There have been only six editors over these 27 years:

- 1954–58 Victor A. Greulach, Univ. North Carolina, Chapel Hill
- 1959–61 Geoffrey M. Jeffery, U.S. Public Health Service, Columbia, SC
- 1961–72 C. Willard Hart, Jr., Acad. Nat. Sci., Philadelphia, PA
- 1972–77 Margaret Y. Menzel, Fla. State Univ., Tallahassee
- 1977–80 Gary E. Dillard, Western Kentucky Univ., Bowling Green
- 1980– James W. Hardin, N.C. State Univ., Raleigh

The editorial policies have remained essentially the same from the beginning. The Bulletin is designed to provide a permanent record of the Annual Meeting and other Association affairs, and to disseminate news of biology in the Southeast. The "News" section, edited by Jon R. Fortman, Miss. Univ. for Women, Columbus, MS, has steadily grown and has recently been expanded to include Museums, Biological Stations, and Botanical Gardens. A "Letters to the Editor" section, which began with the first issue, was envisaged as a lively and stimulating feature, including suggestions, corrections, and debates, but was not continued as a regular section past Vol. 1. A "Placement Service" began in 1965 (Vol. 12, No. 1) but was not continued. A "Book Review" section has appeared sporadically through the volumes. These last three sections (Letters, Placement, Books) can certainly be started again as regular inclusions if there is sufficient interest among the membership.

Several changes are in the immediate future. The smaller size is much more economical, and many of you will recognize similar dimensions in other journals such as the Amer. Jour. Bot. Also, like other societies, we will go to photography of author-prepared abstracts rather than type-

setting, beginning in 1982. This will achieve considerable savings in publication costs. The abstracts certainly are more attractive and uniform if typeset, but costs must be cut if we are to maintain reasonable membership dues.

The Editor welcomes your comments, suggestions, and constructive criticisms regarding the future of the ASB Bulletin.

JWH

COPY DEADLINES

All material for the Bulletins should be in the hands of the editor by the following dates:

January Issue: September 25

April Issue: November 25

July Issue: April 25

October Issue: June 25

COVER PHOTOGRAPHS NEEDED

Suitable photographs of interest to Southeastern Biologists are needed for the cover of the ASB Bulletin. Please submit glossy prints (preferably 4×6 or 5×7) with an appropriate caption and description, to the editor for consideration. Prints will not be returned unless requested.

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE

The University of Alabama, Department of Biology. Drs. **Amelia K. and G. Milton Ward** have joined the Ecology and Systematics Group as Assistant Professors. Both received the Ph.D. from Michigan State University. Prior to joining the Department, Amelia was an Assistant Professor in the Department of Fisheries and Wildlife at Oregon State University, and Milton was a Postdoctoral Research Associate in the same department. Their research interests are in the general area of stream ecosystems.

Rollins College, Biology Department. Dr. **Persis Coleman**, recently appointed department head, specializes in genetics and botany and supervises concentrated independent studies during winter term in addition to conducting in-house research in her field. Dr. **Eileen Gregory** will be participating in an exchange program with Colgate University this winter term and will offer an advanced nutrition course to her students. Professor **Edward Scheer** will be actively involved in the area of Environmental Studies, both on and off campus, as well as conducting directed independent studies in this contemporary field.

University of Florida, Botany Department. Dr. **Robert J. Ferl** has been appointed Assistant Professor of Botany. Dr. Ferl is a graduate of Hiram College in Ohio and obtained his Ph.D. in the area of genetics from Indiana University. His specific interests are in structure and function of plant genes, molecular sources of genetic variation, and in alcohol dehydrogenase gene system in Maize. Dr. **Indra K. Vasil**, Graduate Research Professor of Botany, will chair a symposium on "Cell Culture and Somatic Cell Genetics in Plant Biology" at the XIII International Botanical Congress, to be held in August, 1981, at Sydney, Australia. Dr. Vasil has recently edited two volumes of "Perspectives in Plant Cell and Tissue Culture," published by the Academic Press as Supplements XIA and XIB of the International Review of Cytology. Dr. **William L. Stern**, Professor and Chairman of the Department, has been elected to the position of President-elect of the American Society of Plant Taxonomists. He has been named to the Board of Trustees of Fairchild Tropical Garden in Miami, Florida. Dr. **Dana G. Griffin**, Professor of Botany, spent July in Colombia collecting bryophytes as a participant in the Ecoandes Project. Dr. **Walter S. Judd**, Assistant Professor of Botany and Curator of the Vascular Plant Herbarium, worked during this summer in the Gray Herbarium and the Arnold Arboretum (Cam-

bridge and Boston), in the New York Botanical Garden, and in the U.S. National Herbarium (Washington, D.C.). This period of research was concerned primarily with studies of *Agarista* (Ericaceae) and *Miconia* (Melastomataceae) and their relatives. Dr. **T. W. Lucansky**, Associate Professor of Botany, will attend the Southern Fern Conference at the University of Tennessee in September and present a paper entitled "Comparative Studies in the Neotropical Cyatheaceae: *Metaxya* and *Lophosoria*." Dr. **James W. Kimbrough**, Professor of Botany, presented the Presidential Address at the annual meeting of the Mycological Society of America held in Tucson, Arizona in August 1980. The title of his address was "Cytology, Ultrastructure, and Taxonomy of *Thelebolus* (Ascomycetes)."

Georgia Southern College, Department of Biology. Dr. **William Bruce Ezell, Jr.**, formerly Professor of Biology at The Citadel, was recently named Professor and Head of the department. Dr. Ezell received his Ph.D. from Clemson University. He was the 1974 Outstanding Professor at The Citadel and the 1974 South Carolina "Conservation Educator of the Year," an award given by the South Carolina Wildlife Federation. His research interests include the host-seeking behavior of tabanid flies, saltmarsh insects, and the ecological effects of dredging. Dr. **Daniel V. Hagan** recently joined the Department of Biology. He was formerly associated with Brunswick Junior College. Dr. Hagan was "Professor of the Year" at Brunswick and holds the Ph.D. in Entomology from the University of Georgia. His research interests are in the area of behavioral ecology of cabbage loopers and general insect ecology. Dr. **Keith Hartberg** recently received an NSF grant to construct an environmental chamber for specialized rearing of mosquitoes. Dr. **James H. Oliver**, Callaway Professor of Biology, has received two grants to study hormonal-pheromonal interrelationships in ticks and mites and reproductive processes in ticks and mites.

Wesleyan College, Division of Science and Mathematics. New faculty in the department are: Dr. **Steven McCullagh** of Idaho State University as Assistant Professor of Biology and Ms. **Janet Williams** of Georgia College as Visiting Instructor of Biology. Dr. **Frank A. James** is teaching on a one year appointment at the Colorado School of Mines. Patricia H. Lewis, Associate Professor of Biology, was named Chairman of the Division of Science and Mathematics for 1980-81.

Agnes Scott College, Department of Biology. Dr. **Dale L. Hoyt** has been appointed to the faculty. He

formerly taught at the College of Wooster, Earlham College, and the University of Georgia. **Harry Wistrand** is a co-director of the Third Atlanta Environmental Symposium to be held January 27–28, 1981. An interdisciplinary program, entitled "Ethics and Scarcity," will feature biologists **Barry Commoner** and **Eugene Odum** (University of Georgia) as participants. For information regarding the symposium, contact Dr. Wistrand at the Department of Biology, Agnes Scott College, Decatur, Georgia 30030.

Emory University, Department of Biology. Professors **William D. Burbanck** and **Charles Ray, Jr.** retired in August, 1980, from their long-time positions with the department.

Western Kentucky University, Department of Biology. **Mr. Donald F. Mott** was appointed Project Leader of the U.S. Fish and Wildlife Service's Kentucky Research Station in June 1980. His duties include supervision of the Station staff and organization of research activities that are directed toward solving problems caused by winter roosting blackbirds and starlings in the southeastern United States. **Dr. L. Y. Lancaster** died in May, 1980. Dr. "Lank" was responsible for the strong premedical program at the University for 37 years before his retirement in 1960. Dr. Lancaster was recognized as an ornithologist. **Dr. Lewis B. Lockwood**, recognized as an outstanding pioneer industrial microbiologist, died August 22, 1980. He accepted a position as Adjunct Professor of Biology in 1971 following long and successful tenures with the Department of Agriculture and industry where he continued research on fermentation processes. Until he resigned his professorship in November, 1979 due to failing health, he taught courses in microbiology and directed various student research projects. Dr. Lockwood was active in several community organizations as well as in scientific societies. **Dr. Ernest O. Beal**, recognized internationally as an authority on aquatic vascular plants, died August 31, 1980. Dr. Beal served as head of the biology department from 1968 to 1978. Although ill health forced him to retire from classroom teaching in 1978, he continued his research and completed three manuscripts for journal publication. He was formerly at North Carolina State University, 1954–1968.

University of Southwestern Louisiana, Department of Biology. **Mr. Garrie Landry** has joined the faculty as Assistant Herbarium Curator and will assist with freshman level classes.

Louisiana Tech University, Department of Zoology. **Mr. Scott Weathersby** recently retired after forty years of service. He was replaced by **Dr. James Spaulding** (invertebrate development) from Edinboro State College. During the summer of 1980, **Dr. John Wakeman** (physiology) was a Research Scientist for Facilities Development for the newly organized Louisiana Universities Marine Consortium. **Dr. Bill Davis** (ichthyology) received the 1980–81 Faculty Senate Chair award, which included a check for \$2000 and recog-

nition for outstanding teaching, service, and research. **Dr. Margaret Peaslee** (histology, and Department Head) is the Project Director for "Student Investigations of Nutritional Effects on Tissues." **Dr. Paul Ramsey** (genetics) presented a paper, "Factors Influencing Blood Chemistry in Nutria," at the first Worldwide Furbearer Conference, held in August by the Appalachian Environmental Laboratory, Maryland.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. During July 1980, **Dr. Sally Richardson**, who heads the ichthyoplankton research group, served on a national panel to review research proposals submitted to the Office of Marine Pollution Assessment of the National Oceanic and Atmospheric Administration.

Belhaven College, Department of Biology. **Dr. Al P. Chestnut** has been appointed to Assistant Professor. He received his Ph.D. from the University of Southern Mississippi. His research was conducted at the Gulf Coast Research Laboratory on Distribution, Population Dynamics, and Reproductive Biology of the burrowing clam *Diplothyra sonithii*. Research interests include ecology of marine and estuarine invertebrates and reproductive biology of bivalve mollusks.

Elon College, Biology Department. **Dr. Maurice Whittinghill** is serving a second year as the T. E. Powell, Jr. Professor of Biology at Elon College. Dr. Whittinghill comes to Elon from the Zoology Department at the University of North Carolina at Chapel Hill where he served as Associate Professor, Professor, and Professor Emeritus. He will continue to teach courses in genetics.

Duke Power Company, Environmental Services Section. The North American Benthological Society has for the past twelve years published a yearly bibliography on benthic biology. Starting with the 1979 edition, **Tommy Bowen** will be compiling the Ceratopogonidae (Diptera) section of the bibliography. Any papers published from 1977 onward could be included. If you have published or plan to publish papers in the future on Ceratopogonidae, he would appreciate either a copy or the proper citation. Contact: Tommy W. Bowen, Duke Power Company, Environmental Services Section, Route 4, Box 531, Huntersville, North Carolina 28078. **Kenneth Manuel** (Ph.D. Auburn University in Entomology) has accepted a position with the Macroinvertebrate group and will begin October 1980. The Macroinvertebrate group is presently conducting a light trapping program in the area. Anyone interested in running temporary light traps in different areas of the survey area should contact Tommy Bowen at the above address.

North Carolina State University, Department of Horticultural Science. Recent additions to the faculty are: **Dr. William J. Lamont**, Extension Assistant Professor, from Cornell University, with responsibilities in the area of vegetable crops. **Dr. Mary Peet**, Assistant Professor, from Duke University, with teaching and research responsibilities in vegetable production.

Dr. Eric Young, Assistant Professor, from Rutgers University, with research responsibilities in apple cultivation. **Mr. Will Hooker**, Assistant Professor, with teaching responsibilities in Landscape Horticulture. Mr. Hooker had previously served one year with the department as Visiting Assistant Professor after receiving the degree of MLA from the Department of Landscape Architecture at NCSU.

North Carolina State University, Department of Botany. **Dr. Dennis H. Knight** has joined the Department for the 1980-81 academic year. He is on sabbatical leave from the University of Wyoming and his research interests are in the area of ecology. **Dr. Laura Meagher** is on a 6 months appointment to the Botany Department. She is a Visiting Assistant Professor of Science Policy, on leave from the North Carolina Board of Science and Technology. Dr. Meagher will be working on the project "Molecular Biology as Applied to Agriculture and Forestry." **Dr. Tadanori Fukuda**, on sabbatical leave from his position of Research Associate in the Department of Forest Products, Faculty of Agriculture, Nagoya University, Nagoya, Japan, has joined the cell and tissue culture laboratory in the Department for a period of 10 months. He was awarded a grant from Japan's Ministry of Education. **Dr. Jerome P. Miksche**, Head of the Botany Department, will undertake a 6 month exploration of the application of molecular biology to agriculture and forestry. Funding for this project comes from the North Carolina Board of Science and Technology.

Belmont College, Department of Biology. **David R. Hill** recently completed his Ph.D. in Botany from North Carolina State University. His dissertation was entitled "Phytoplankton Ecology and Trophic State Analysis of Radnor Lake, Radnor Lake Natural Area, Nashville, Tennessee."

University of Tennessee, Botany Department. After 33 years of service to the Department of Botany, **Dr. Fred H. Norris** has retired effective 1 August 1980. During his years in the Department, his teaching was recognized by a UT Alumni Distinguished Teaching Award and his contributions to the greenhouse operation by a special fund established in his name by the graduate students. His friends have also recognized his service by the creation of the Fred Norris Book Fund in the UT Library. Fred is expected to continue to contribute to the departmental program on a part-time basis by teaching in the spring flora course. **Dr. Hal DeSelm** and **Paul Schmalzer** have been granted a continuation, with added funds, to examine the vegetation and flora of the Obed National Wild and Scenic River of Cumberland and Morgan Counties, Tennessee.

University of South Carolina, Department of Biology. **Dr. Berten Ely** has received a grant from NSF for research on the analysis of differentiation in *Caulobacter*. **Dr. Patricia DeCoursey** has been awarded a Senior Postdoctoral Fellowship from the American

Association of University Women. Dr. DeCoursey's research (Phase Response Systems in the Entrainment of Biological Rhythms) will be conducted at the University of Oregon in the laboratory of **Dr. Michael Menaker**. New appointments to the department include: **Dr. Sarah Woodin**, formerly of the Department of Earth and Planetary Sciences, The Johns Hopkins University; **Dr. David Wetthey**, formerly of the NERC Unit of Marine Invertebrate Biology, University College of North Wales; **Dr. David Lincoln**, of the Department of Biological Sciences, Stanford University and **Dr. Charles F. Duggins**, formerly of Florida State University. **Dr. Felix Lauter** passed away unexpectedly on May 22, 1980. He joined the University of South Carolina in 1962, having earned his Ph.D. from Louisiana State University. His many students who have gone on to earn their M.D. degree will remember him dearly.

Louisiana State University, Department of Botany. **David J. Longstreth**, Assistant Professor of Botany, is currently an associate investigator on a sea grant study, "Methods for Monitoring Sublethal Stresses in Coastal Plant Communities," with **I. A. Mendelsohn**, **K. L. McKee**, and **W. H. Patrick, Jr.** from the center for Wetland Resources, LSU. **Michael T. Postek**, Visiting Assistant Professor, recently completed his doctorate in the Department of Botany, LSU. Dr. Postek, student of **Shirley C. Tucker**, specialized in plant anatomy and plant morphology. The title of his dissertation was "Ontogeny and Ultrastructure of the Leaf of *Magnolia grandiflora*."

Old Dominion University, Department of Biological Sciences. **Lytton J. Musselman**, Associate Professor and Curator of the Herbarium, was a visiting professor at the Weed Research Organization of the Agricultural Research Council, Oxford, England for six months. He was working under contract with the U.S. Department of Agriculture's Animal and Health Inspection Service to determine the host range and investigate the reproductive biology of *Striga gesnerioides*, a parasitic weed recently discovered in Florida.

ABOUT INSTITUTIONS

University of Southwestern Louisiana, Department of Biology. The Biology Department recently occupied the newly renovated section of its building—Billeaud Hall. This portion contains teaching laboratories, lecture rooms, offices and a museum.

Elon College, Biology Department. The Biology Department, in affiliation with Biomedical Reference Laboratories, Inc., of Burlington, N.C., has developed a new program in Cytotechnology. The first class was admitted this fall. Students may work for a B.S. degree in this program.

University of North Carolina at Charlotte, Department of Biology. A 3-week summer course with a

unique combination of breadth and depth in studying the biology of marine organisms will be offered in 1981. Students will hear lectures from the staff and invited speakers as well as do concentrated work in the laboratory. The lab will emphasize individual and group research projects according to the student's interest. Lectures and project designs will be held on the UNCC campus while the laboratory portion of the course will be conducted at a marine laboratory on the North Carolina coast. The course is designed for advanced undergraduates and graduate students and carries 3 hours credit. For further information write to: Topics in Marine Biology, Department of Biology, UNCC, Charlotte, NC 28223.

North Carolina State University, Department of Horticultural Science. The Horticultural Club was presented "The Outstanding Collegiate Club Award" for the second consecutive year by the Southern Region of the American Society for Horticultural Science. The Club also was awarded the "Best of Garden Design" plaque at the 1980, 20th Annual Southern Living Show held in Charlotte, North Carolina.

University of Tennessee, Botany Department. Partial renovation of the Hesler Biology Building has resulted in new departmental offices, renovated teaching space for freshman botany, and a new greenhouse headhouse and glasshouse for teaching and research.

Memphis State University Hosts Joint Herp. Meeting. The 1981 joint annual meeting of The Society for the Study of Amphibians and Reptiles and The Herpetologists' League will be held on the campus of Memphis State University during 9-14 August 1981. More information may be obtained by contacting: Dr. James S. Jacob, Department of Biology, Memphis State University, Memphis, TN 38152.

ABOUT BIOLOGICAL STATIONS

Highlands Biological Station, Highlands, North Carolina. The Station will offer a special advanced course on the *Fleshy Fungi of the Southern Appalachians*, July 14-August 14, 1981. The instructor is Dr. Ronald H. Petersen, University of Tennessee. The course will emphasize taxonomic research on the rich fungus flora of the region, and will include considerable field work in the Blue Ridge and Great Smoky Mountains. It will be taught at the senior-graduate level, and will carry six semester hours credit. For further information and application forms write Highlands Biological Station, P.O. Drawer 580, Highlands, NC 28741.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Smithsonian Institution. The Smithsonian Foreign Currency Program, a national research grants pro-

gram, offers opportunities for support of research in Burma, Guinea, India, and Pakistan in the following disciplines: Anthropology and Archaeology and related disciplines, Systematic and Environmental Biology, Astrophysics and Earth Sciences, and Museum Programs. Grants in the local currencies of the above listed countries are awarded to American institutions for the research of senior scientists. Collaborative programs involving host country institutions are welcome and frequently required. Awards are determined on the basis of competitive scientific review. The deadline for submission is November 1 annually. For further information write the Foreign Currency Program, Office of Fellowships and Grants, Smithsonian Institution, Washington, D.C. 20560, or call (202) 287-3321.

The North Carolina State Museum of Natural History. The Museum announces publication of the *Atlas of Freshwater Fishes of North America*. The atlas, prepared under a contract with the U.S. Fish and Wildlife Service, is a collection of accounts of the 777 species of fish known to occur in fresh waters in Canada and the United States. For further information contact David S. Lee, N.C. State Museum of Natural History, P.O. Box 27647, Raleigh, NC 27611. The Museum has been allocated planning monies for a new museum to replace its satellite Hampton Mariners Museum in Beaufort. A waterfront tract in historic Beaufort was donated to the state as a site for the new museum. The museum's theme will be "Man and the Sea."

The University of Alabama Museum of Natural History. Alabama Museum of Natural History Bulletin Number 5 containing "Notropis candidus, a new cyprinid fish from the Mobile Bay basin, and a review of the nomenclatural history of *Notropis shumardi* (Girard)" by Royal D. Suttkus; and "Noturus stanauli, a new madtom catfish (Ictaluridae) from the Clinch and Duck Rivers, Tennessee" by David A. Etnier and Robert E. Jenkins is now available for \$2.50 and may be ordered from: Alabama Museum of Natural History, P.O. Box 5897, University, AL 35486.

MEETING

International Symposium: Energy and Ecological Modeling. April 20-23, 1981. Galt House, Louisville, KY. Sponsored by: Intern. Soc. Ecol. Mod., in cooperation with the Ecol. Soc. Amer., ORNL, and Univ. Louisville. For information contact Dr. W. J. Mitsch, ISEM Louisville Conference, Systems Science Institute, University of Louisville, Louisville, KY 40292.



1937

QV301.478
The ASB

PLEASE PRINT NAME LEGIBLY
AND MARK * IF URGENTLY
PUBLICATION DUE ^{Ab}

BULLETIN

Volume 28, Number 2

(ISSN 0001-2386)

April 1981



Prize-winning Photograph

***The Official Quarterly Publication of
The Association of Southeastern Biologists***

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

Past President — James W. Hardin, Botany, North Carolina State University, Raleigh, NC 27650

President Elect — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Vice-President — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbacok, Box 15134, Atlanta, GA 30333

Executive Committee —

James L. Riopel (1981), Biology, University

of Virginia, Charlottesville, VA 22901

Donald J. Shure (1981), Biology, Emory University, Atlanta, GA 30322

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Seawee, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

AAAS Representative, Section G —

Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

Program of the 42nd Annual Meeting	17
Thursday Evening Program	20
Schedule of Paper Sessions and Symposia	21
Map of Campus	41
Abstracts of Papers	43
Author Index	105
ASB Candidates for Office	109
News of Biology in the Southeast	112
Mt. Lake Biological Station—1981 Program	116

COVER

This photograph of a mushroom won first place in the Black & White category in the 3ed Nature Photography Contest sponsored by the N.C. State Museum of Natural History. Mrs. Vance Knight of Fayetteville received a \$50 cash prize for her winning photo. The NCSMNH will sponsor another contest in June. For information contact Mary K. Clark.

TIME AND PLACE OF FUTURE MEETINGS

1982	April 14–17	Eastern Kentucky University, Richmond
1983	April 13–16	University of Southwestern Louisiana, Lafayette
1984	April	Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Co., Greenville, SC



Program of the 42nd Annual Meeting of the Association of Southeastern Biologists

University Center

The University of Tennessee, Knoxville

(615) 974-3453

A joint meeting with the Southeastern Section of the Botanical Society of America, the Southeastern Chapter of the Ecological Society of America, the Southern Appalachian Botanical Club, the Southeastern Society of Parasitologists, the Southeastern Region of Beta Beta Beta National Honorary Biological Society, the Southeastern Division of the American Society of Ichthyologists and Herpetologists, and the Southeastern Fishes Council.

REGISTRATION AND INFORMATION

Registration for the ASB meeting, purchase of meal tickets and registration for field trips is arranged thru PRE-REGISTRATION. Pre-registration enables The University of Tennessee to provide the best possible service at the lowest possible cost. Those who have pre-registered may obtain their information and ticket package at the Campus Sheraton Inn on Wednesday (5 P.M.–9 P.M.) or at the University Center, Room 239 on Thursday and Friday (8 A.M.–5 P.M.). Late registration is available at these times. Fees: \$3.00 students, \$5.00 regular.

TICKETS FOR MEALS

(A limited numbers of tickets will be available for those who failed to pre-register.)

Southeastern Society of Parasitologists: Thursday luncheon, approx. \$4.00.

Southeastern Chapter, Ecological Society of America: Thursday luncheon, approx. \$4.00.

Southern Appalachian Botanical Club and Southeastern Section, Botanical Society of America: Friday breakfast: \$3.95.

ASB Banquet: Friday evening; approx. \$7.00 faculty, \$5.00 students. (Buffet featuring steamship round of beef, baked ham, and shrimp creole.)

PARKING

Parking is available behind and below the Campus Sheraton Inn when picking up registration materials on Wednesday. Campus parking is available in the parking garage adjacent to the south end of the University Center (enter off of 15th St.). Additional parking is available in campus lots N3 and G7. These are identified on the campus map. Parking permits are available upon request at the registration and information desk.

PLACEMENT SERVICE

Room 220, University Center, is available for institutions with positions available and for individuals seeking employment. Persons intending to use this service should bring the necessary information and notices. Room 220 is available from 9–11 A.M. and 1–3 P.M. on Thursday, April 9.

LOCAL POINTS OF INTEREST

Campus:

- Recently completed Walters Life Science Building, Tour of facilities, Room M 303, Friday, 4:30 P.M.
- University Aquatic Center, indoor/outdoor Olympic pools.
- All weather Olympic track.
- Tennis stadium and courts.
- Carousel and Clarence Brown Theaters.
- McClung Museum.

Knoxville Area:

- U.T. Arboretum, Oak Ridge, Tn.
- American Museum of Science and Energy, Oak Ridge, Tn.
- Dogwood Arts Festival (April 10–26)
- The Great Smoky Mountains National Park, Cades Cove—A living Museum
- Gatlinburg and Pigeon Forge, family amusement centers (ASB discounts available upon request from University Department of Conferences).
- Knoxville Zoological Park.
- Westside Dinner Theater.
- Lost Sea—Cave and Underground Lake.
- Blount Mansion, built 1792.
- James White Fort.
- Dulin Gallery of Art.
- Energy Expo '82—Worlds Fair Site.

FIELD TRIPS:

1. Great Smoky Mountains National Park
 - (A) Aquatic research programs (Staff, Uplands Research Laboratory (Dr. Gary Larson, Ray Matthews, Steve Moore).
 - (B) Vegetation Studies (Staff, Uplands Research Laboratory, Dr. Peter White, Dr. Susan Bratton).
 - (C) Wildlife Management (Staff, Uplands Research Laboratory) and Dr. Mike Pelton.
 - (D) Ecology and Natural History (Dr. Clebsch).
 - (E) Resource Management in the GSMNP (Dr. Gary Larson, Stuart Coleman).
2. Coweeta—U.S. Forest Service Research Station (Dr. Wayne Swank).
3. Oak Ridge National Laboratory—Environmental Sciences Division and Biology Division (Dr. Reichle).
4. Ocoee River—Copper Basin (Dr. Amundsen, Dr. Heilman).
5. Obed Wild and Scenic River (near Petros) (Dr. DeSelm and others).

LOCAL ARRANGEMENTS COMMITTEE:

- Chairperson—Frank McCormick—(974-3065)
- Pre-registration and Registration—Dr. James Caponetti—(974-2256)
- Program—Dr. Hal DeSelm—(974-2256)
- Exhibits—Dr. Boyd Dearden—(974-7129)
- Field Trips—Dr. Clif Amundsen—(974-3065)
- Special Events—Dr. Ed Clebsch—(974-2256)
- Meeting Rooms and Audio Visual Aids—Dr. Sandy Echternacht—(974-6041)
- Banquet, Meals, and Social Events—Dr. Gary Sayler—(974-3065)

PHONE NUMBERS OF INTEREST (Area Code 615):

- Universal Emergency—911—
- Tourist Information 523-2316
- Chamber of Commerce 637-4550
- Weather 573-8351
- Knoxville—for conventions and visitors 523-7263
- AAA Motor Club 637-1910
- Travelers Aid 522-8718

PROGRAM SUMMARY Wednesday April 8, 1981

Full-day Field trip.

5:00 P.M.—9:00 P.M.

9:00 P.M.—11:00 P.M.

Ecological Society of America.

Pick up information and materials requested during preregistration. Late registration available, Campus Sheraton Inn.

Cash Bar Social, Sheraton Campus Inn.

Thursday, April 9, 1981

ALL SESSIONS ARE HELD IN THE UNIVERSITY CENTER.

8:00 A.M.—5:00 P.M.

Late Registration and Information, Room 239, University Center.

8:00 A.M.—5:00 P.M.

EXHIBITS, Crest Room, University Center.

9:00 A.M.—11:00 A.M.

1:00 A.M.—3:00 P.M. Placement Service, Room 220, University Center.

PAPER SESSIONS (NO SMOKING)

8:00 A.M.—Noon

Symposium: Ecosystems of the Southern Appalachian Highlands. Session I. Auditorium.

9:00 A.M.—11:33 A.M.

Animal Physiology, Session I, Room 226-7.

8:00 A.M.—11:51 A.M.

Ichthyology & Herpetology, Session I, Shiloh Room.

8:00 A.M.—11:38 A.M.

Cellular, Molecular and Microbiology, Room 224.

8:00 A.M.—11:38 A.M.

Cryptogamic Botany, Room 225.

8:00 A.M.—10:46 A.M.

Dendrochronology, Room 223.

9:00 A.M.—10:36 A.M.

Parasitology, Session I, Room 221.

BUSINESS MEETINGS

11:00 A.M.—Noon

Southeastern Section of Parasitologists, Room 221.

Noon

Southeastern Division of the American Society of Ichthyologists and Herpetologists, Room 220.

3:00 P.M.

ASB Executive Committee Meeting, Room 687, Dabney Hall, Ecology Building.

LUNCHEON

Noon Southeastern Society of Parasitologists, Executive Dining Room (3rd Floor).

BUSINESS MEETING AND LUNCHEON

Noon Southeastern Section of the Ecological Society of America. Ballroom. Featured Speaker: Dr. Elsie Quarterman, "A Fresh Look at Climax Forests of the Coastal Plain."

2:00 P.M. Southeastern Society of Parasitologists, Tour of UTK, College of Veterinary Medicine.

PAPER SESSIONS (NO SMOKING)

1:00 P.M.- 3:45 P.M. Symposium: Chromosome Structure and Function, Session I, Auditorium.

1:00 P.M.- 4:30 P.M. Plant Ecology, Session I, Shiloh Room.

1:00 P.M.- 4:59 P.M. Plant Systematics, Session I, Room 225.

1:00 P.M.- 4:51 P.M. Ichthyology & Herpetology, Session II, Room 226-7.

1:00 P.M.- 4:59 P.M. Animal Ecology, Room 223.

1:00 P.M.- 4:38 P.M. Aquatic Ecology, Session I, Room 224.

GENERAL SESSION

7:30 P.M. Address of Welcome: Dr. Walter Herndon, Vice Chancellor for Academic Affairs, The University of Tennessee. Response: Dr. Franklin Flint, ASB President. Feature Address: Dr. Robert D. Moseley, Jr. M.D., Chairman, Department of Radiology, University of New Mexico, School of Medicine. Title: "Acceptability of Radiation Risk."

9:00 P.M.-10:00 P.M. Hospitality Hour, Courtesy of Fisher Scientific Company, Campus Sheraton Inn.

Friday, April 10, 1981

7:00 A.M. Business and Breakfast Meeting. Southern Appalachian Botanical Club and Southeastern Section, Botanical Society of America. Executive Dining Room.

8:00 A.M. Past Presidents' Breakfast, Room 218.

8:00 A.M.- 5:00 P.M. Late Registration and Information, Room 239.

8:00 A.M.-Noon EXHIBITS, Crest Room

PAPER SESSIONS (NO SMOKING)

8:00 A.M.-11:00 A.M. Symposium: Ecosystems of Southern Appalachian Highlands. Session II, Auditorium.

8:00 A.M.-11:00 A.M. Plant Ecology, Session II, Shiloh Room.

8:00 A.M.-11:00 A.M. Plant Systematics, Session II, Room 226-7.

8:00 A.M.-11:00 A.M. Plant Physiology, Room 221.

8:00 A.M.-11:00 A.M. Cytology, Genetics and Developmental Biology, Room 223.

8:00 A.M.- 9:56 A.M. Parasitology, Session II, Room 225.

10:00 A.M.-11:00 A.M. Plant Systematics, Session III, Room 225.

9:00 A.M.-11:00 A.M. Invertebrate Zoology, Room 224.

BUSINESS MEETINGS

11:00 A.M. ASB, Auditorium

Noon Luncheon and Business Meeting, Beta Beta Beta, Ballroom.

Noon Business Meeting, Southeastern Fishes Council, Room 220.

PAPER SESSIONS (NO SMOKING)

1:00 P.M.— 3:45 P.M.	Symposium: Chromosome Structure and Function, Session II, Auditorium.
1:00 P.M.— 4:34 P.M.	Aquatic Ecology, Session II, Room 225.
1:00 P.M.— 4:53 P.M.	Ichthyology and Herpetology, Session III, Room 220.
1:00 P.M.— 4:17 P.M.	Plant Ecology, Session III, Room 223.
1:00 P.M.— 4:04 P.M.	Plant Ecology, Session IV, Room 224.
1:00 P.M.— 2:46 P.M.	Teaching Methods, Room 221.
3:00 P.M.— 4:00 P.M.	Laboratory Safety Guidelines, Roundtable Discussion, Room 221.
1:00 P.M.— 5:00 P.M.	Beta Beta Beta, Eastern Section, Room 226-7.
	Beta Beta Beta, Western Section, Shiloh Room.
4:30 P.M.	Tour of Biological Sciences Facilities, including Shops, Animal Care Facility, EM Facility, Analytical Laboratories and Teaching Facilities. Room M 303, Walters Life Sciences Building.
7:00 P.M.	ASB Banquet, Presentation of Awards and Past President's Address: A View From Down Under , by Dr. James W. Hardin. Ballroom.
9:00 P.M.	Cash Bar Social, Campus Sheraton Inn.

Saturday, April 11, 1981

8:30 A.M.	Executive Committee Breakfast and Meeting, Sheraton Campus Inn.
8:00 A.M.	Field Trips. Parking lot in front of Walters Life Science Building, facing Cumberland Ave.

The Thursday Evening General Session

Acceptability of Radiation Risk

The 1981 Thursday evening program features **Dr. Robert D. Moseley Jr.**, M.D. Dr. Moseley is widely regarded as one of our nation's most articulate spokesmen on risks associated with exposures to ionizing radiations.

Risk assessment is a complex and difficult activity. Even more challenging is the task of estimating a degree of biological risk or public risk which is acceptable. Dr. Moseley is well qualified to address this important and controversial subject. He presently serves as Chairman of the Department of Radiology, at the University of New Mexico. He earlier held a similar position at The University of Chicago. Professional activities include being a member of U.S. delegations to several international conferences. These include The International Conference on Peaceful Uses of Atomic Energy, the 11th thru 15th International Conferences of Radiology, and serving as Chairman of the

U.S. delegation to the United Nations Scientific Committee on the Effects of Atomic Radiation. Honors include the Gold Medal of the XIII International Congress of Radiology, the Gold Medal of the Association of University Radiologists, 1980, and the Gold Medal of the American College of Radiology, 1980. Dr. Moseley has published nearly 100 articles on the subject of the biological effects of ionizing radiations. He presently serves on a Committee of the National Academy of Sciences which is reviewing federal research programs on the biological effects of ionizing radiations.

We can anticipate an exciting and thought provoking presentation of a subject of interest to the entire scientific community.

Co-sponsored by ASB and Southeastern Section of the Botanical Society of America.

SCHEDULE OF PAPER SESSIONS

THURSDAY MORNING—APRIL 9

ECOSYSTEMS OF THE SOUTHERN APPALACHIAN HIGHLANDS

Auditorium, University Center

Symposium co-sponsored by the Association of Southeastern Biologists and the Southeastern Chapter of the Ecological Society of America. Organizers: H. R. DeSelm, A. E. Echternacht, and E. E. C. Clebsch, University of Tennessee.

Session I

Chairperson: Dr. S. Dan Pittillo, Western Carolina University.

8:00 A.M.	Introduction: H. R. DeSelm, University of Tennessee	10:13 A.M.	Vegetation of the Mixed Mesophytic Forest Region and its Relation to Environmental Factors: C. Ross Hinkle, Science Applications Incorporated, Oak Ridge
8:02 A.M.	Chairperson's Remarks		
8:03 A.M.	The Geological Basis for Southern Appalachian Ecosystems: John Rogers, Yale University	10:43 A.M.	Vegetational Patterns of the Ridge and Valley Physiographic Province: William H. Martin, III, Eastern Kentucky University
8:33 A.M.	Soils: Stanley Buol, North Carolina State University		
9:03 A.M.	Climate: J. T. Blazing, Oak Ridge National Laboratory	11:13 A.M.	Vegetation of the Southern Blue Ridge Province: Arthur W. Cooper, North Carolina State University
9:33 A.M.	History of the Biota of the Southern Appalachian Highlands: Paul A. and Hazel R. Delcourt, University of Tennessee and Oak Ridge National Laboratory	11:43 A.M.	Discussant: Edward E. C. Clebsch, University of Tennessee
10:03 A.M.	Break		

DENDROCHRONOLOGY

Room 223, University Center

Special Session arranged by F. W. Woods, University of Tennessee.

Presiding: Dr. F. W. Woods; and Dr. Lynne Bowers, Louisiana State University.

8:00 A.M.	1. Heikkinen, Herman J. (American Institute of Dendrochronology). The Key-year Dendrochronological Technique.	8:52 A.M.	5. Phipps, Richard L. (U.S. Geological Survey). Reconstruction of Streamflow on the Occoquan River, Virginia.
8:13 A.M.	2. Woods, F. W. and Bill Moschler. (University of Tennessee). Let the Untold Secrets Unfold.	9:05 A.M.	6. Hupp, Cliff R. (U.S. Geological Survey). Dendrochronological Evidence of Rock Sliding in Central Appalachia.
8:26 A.M.	3. Puckett, Larry J. (U.S. Geological Survey). The Implications of Acid Rain to Eastern Dendroclimatology.	9:18 A.M.	Break
8:39 A.M.	4. Lawson, Merlin P. and Karl C. Kuivinen. (University of Nebraska). Dendroclimatic research in southern Greenland.	9:28 A.M.	7. Duvick, D. N. (Oak Ridge National Laboratory). Dendroclimatology of White Oak (<i>Quercus alba</i>) in Iowa.
		9:41 A.M.	8. Moschler, Bill and Frank W. Woods. (University of Tennessee).

- see). A New Version of the Gamma Ray Densitometer.
- 9:54 A.M. 9. McRae, Deborah D. (University of Tennessee). Using a Gamma Densitometer to Analyze a Loblolly Pine Thinning Study.
- 10:07 A.M. 10. Blasing, T. J. and D. C. West. (Oak Ridge National Laboratory). Estimating Past Climatic Conditions Using Tree Rings in the Eastern United States.
- 10:20 A.M. 11. Coole, Edward R. (Lamont-Doherty Geological Observatory). On the Development of a Tree-ring Network in Eastern North America.
- 10:33 A.M. 12. Stahle, David W., John C. Hehr and Graham G. Hawks. (University of Arkansas and the Arkansas Archeological Survey). Tree-ring Network Collections in the Central United States.

ANIMAL PHYSIOLOGY

Rooms 226-7, University Center

Presiding: Dr. Marion R. Wells, Middle Tennessee State University.

- 9:00 A.M. 13. Bowen, S. J. and K. W. Washburn. (University of Georgia). The Effect of Thyroid Hormones or Thiouracil on the Ability of the Young Chicken (*Gallus domesticus*) to Withstand Heat Stress.
- 9:13 A.M. 14. Bauman, Thomas R. (University of Alabama). The Effects of Age on Nuclear Triiodothyronine Binding Sites in Rat Liver.
- 9:26 A.M. 15. Jones, A. Steve, Mike Amos and Gerald C. Llewellyn. (Virginia Commonwealth University). ⁶⁵Zn-Zinc Chloride Retention and Distribution Following Dietary Aflatoxin Treatment in Golden Syrian Hamsters, *Mesocricetus auratus*.
- 9:39 A.M. 16. Tabatabai, Rebecca N. and P. S. Rushton. (Memphis State University). Daily Variation of Mouse Blood Cells.
- 9:52 A.M. 17. Rushton, P. S., Rebecca N. Tabatabai and Bill Summers. (Memphis State University). Daily Variation in the Corticosteroid Levels in Mouse Blood.
- 10:05 A.M. Break
- 10:15 A.M. 18. Foreman, Charles W. (The University of the South). Geographic Variation of Hemoglobin Gene Frequencies in Cotton Rats, *Sigmodon hispidus*.
- 10:28 A.M. 19. Davis, Kenneth B., Bill A. Simco and Pam Torrance. (Memphis State University). Temperature and Photoperiod Control of Reproduction in Channel Catfish, *Ictalurus punctatus*.
- 10:41 A.M. 20. Tomasso, J. R., Bill A. Simco and K. B. Davis. (Memphis State University). General and Specific Physiological Responses of Channel Catfish (*Ictalurus punctatus*) to Elevated Environmental Nitrite.
- 10:54 A.M. 21. McClurkin, Iola T., Andrea K. Miksa and Luther A. Knight, Jr. (University of Mississippi). The Histology and Histochemistry of Skeletal Components in Paddlefish (*Polyodon spathula*).
- 11:07 A.M. 22. Kasso, William B. and Marion R. Wells. (Middle Tennessee State University). A Survey of Trihalomethanes in the Drinking Water System, Murfreesboro, TN.
- 11:20 A.M. 23. Olewine, D. A., P. A. Currie, G. M. Beaudreau, M. T. White, D. T. Purdom, S. T. Tuggle and C. G. Hames. (Southern Georgia College and Evans County Heart Research Unit). Effects of Aspirin and Exercise on the Modified Ivy and Duke Bleeding Times of College-aged Males.

CELLULAR, MOLECULAR AND MICROBIOLOGY

Room 224, University Center

Presiding: Dr. Peter Kivic, University of Tennessee.

- | | | | |
|-----------|---|------------|--|
| 8:00 A.M. | 24. Pocratsky, Linda A. and Patricia L. Walne. (University of Tennessee). Chemical Characterization of the Lorica and Extracellular Mucilage of the Green Alga <i>Phaeococcus lenticularis</i> . | | bama). Changes in Gamma-glutamyl Transpeptidase Activity during 2-Acetylaminofluorene Induced Hepatocarcinogenesis in Rats. |
| | | 9:44 A.M. | Break |
| 8:13 A.M. | 25. Dunlap, John R., Larry K. West, Patricia L. Walne and James Bentley. (University of Tennessee, Knoxville and Oak Ridge National Laboratory). Spatial Segregation of Manganese and Iron in the Envelope of <i>Trachelomonas lefevrei</i> . | 9:54 A.M. | 32. Baylor, Norman and Arthur L. Williams. (University of Kentucky). Isolation and Characterization of Bacteriophage Specialized Transducing Phages Carrying the <i>ilvC</i> Gene of <i>Escherichia coli</i> K-12. |
| 8:26 A.M. | 26. Walne, Patricia L., John R. Dunlap and Peter A. Kivic. (University of Tennessee, Knoxville). Comparative Ultrastructure and Elemental Composition of Envelopes of <i>Strombomonas</i> and <i>Trachelomonas</i> . | 10:07 A.M. | 33. Ensor, Mark and Arthur L. Williams. (University of Kentucky). Use of Bacteriophage Lambda to Isolate Transducing Phages Harboring <i>ilv</i> Genes of <i>Escherichia coli</i> K-12. |
| 8:39 A.M. | 27. Travis, J. C. and L. Shipway. (University of North Carolina at Charlotte). Immune Function in Lymphoma-bearing Mice: Patterns of Suppression. | 10:20 A.M. | 34. Williams, Arthur L. (University of Kentucky). Characterization of Antithyroid Substances (ATS) Produced by <i>Escherichia coli</i> . |
| 8:52 A.M. | 28. Daniel, Robert E., Sally J. Billingsley and D. O. Abbott. (Murray State University and Montana Department of Health and Environmental Sciences). Delta-9-tetrahydrocannabinol: Effects on Macromolecular Synthesis, Metabolism, and Growth in <i>Tetrahymena pyriformis</i> GL. | 10:33 A.M. | 35. Fleming, Diane O. (Wright State University). Mouse Protection Test for Group B <i>Streptococcus</i> , Type III. |
| 9:05 A.M. | 29. Kelly, Janet J. (College of Charleston). <i>In vitro</i> Response of Marine Teleost Fibroblasts to Benzo(a)pyrene and to 4-Nitroquinoline-1-oxide. | 10:46 A.M. | 36. Anderson, A. D., J. Lewis and G. Vredevelde. (University of Tennessee, Chattanooga and Erlanger Hospital). Correlation of Biochemical and Pathological Characters in the Micrococcaceae. |
| 9:18 A.M. | 30. Milling, D. M., F. X. Sargeant and M. B. Maddock. (College of Charleston). Comparative Effects of Cytochrome P450 Induction on the Activation of Benzo(a)pyrene and 2 Aminoanthracene in the Rat and the Toadfish (<i>Opsanus tau</i>). | 10:59 A.M. | 37. Haug, J. L., R. C. Anderson and A. E. Liberta. (Illinois State University). Inhibition of Selected Corn Fungal Pathogens by <i>Pseudomonas</i> Isolates from <i>Tripsacum dactyloides</i> Caryopses. |
| 9:31 A.M. | 31. Capouya, Eli R. and Ronald Lindahl. (The University of Alabama). | 11:12 A.M. | 38. Corkran, Julie L. and Conrad E. Wickstrom. (Emory University). Growth and Nitrogen-fixation Characteristics of a Thermophilic Blue-green Alga. |
| | | 11:25 A.M. | 39. Koenig, David and Bailey Ward. (University of Mississippi). Studies on Growth Characteristics of the Crude Oil Utilizing Colorless Alga, <i>Prototheca zopfii</i> Kruger. |

CRYPTOGAMIC BOTANY SESSION

Room 225, University Center

Presiding: Dr. Frank D. Bowers, University of Wisconsin in Stevens Point.

- | | | | |
|-----------|--|------------|---|
| 8:00 A.M. | 40. Cranfill, Raymond. (University of Michigan). A Systematic Overview of the Woodwardioid Ferns. | 9:44 A.M. | Break |
| 8:13 A.M. | 41. Sullivan, Joseph H. and James W. Wallace. (Western Carolina University). Flavonoids of Representative Species of the Marsileaceae. | 9:54 A.M. | 48. Camburn, Keith E. (Kentucky Nature Preserves Commission). The Gomphonemataceae of Kentucky. |
| 8:26 A.M. | 42. Brack-Hanes, Sheila D. and Barry A. Thomas. (Eckerd College and Goldsmith's College, University of London). A Re-examination of <i>Lepidostrobos</i> . | 10:07 A.M. | 49. Whitford, L. A. (North Carolina State University). More about "Rare" Freshwater Algae. |
| 8:39 A.M. | 43. Renzaglia, Karen S. (East Tennessee State University). A Survey of Gametangial Position and Protective Structure in the Simple Thalloid Liverworts. | 10:20 A.M. | 50. Ralston, Frank L., Patricia L. Walne and Carl J. Wust. (University of Tennessee, Knoxville). A Mouse Model To Detect Allergens from <i>Chlorella</i> Isolated from Common Housedust. |
| 8:52 A.M. | 44. Douglass, Caroline C., John E. Fairey, III and Walter C. Credle. (Clemson University). A Preliminary report on the Bryophytes of the Proposed Basin for the Richard B. Russell Lake. | 10:33 A.M. | 51. Mainwaring, H. R., M. D. Moody and J. T. Joyce. (Western Carolina University). Cytology of the Ascus of the Ascomycete Fungus <i>Neocosmospora vasinfecta</i> . |
| 9:05 A.M. | 45. Bowers, Frank D. (University of Wisconsin-Stevens Point). Identification of <i>Sphagnum</i> Taxa (Peat Mosses) in the Field (in Wisconsin) Using Macroscopic Characters. | 10:46 A.M. | 52. Wolf, Frederick T. (Vanderbilt University). The Biology of Entomophthora. |
| 9:18 A.M. | 46. Petersen, Raymond L. (Howard University). A Double Stress Basis for Heavy Metal Toxicity in Mineral Deficient Cultures of Moss and Fern Gametophytes. | 10:59 A.M. | 53. Varney, Dan R., Malcolm Siegel, Robert Buckner, and Richard Champman. (Eastern Kentucky University and University of Kentucky). Control of the Endophyte, <i>Epichloe typhina</i> , in <i>Festuca arundinacea</i> . |
| 9:31 A.M. | 47. Odebode, A. Chris, Raymond L. Petersen and Lafayette Frederick. (Howard University). The Effects of Heavy Metals on the Growth of the Lichen Phycobiont <i>Trebouxia erici</i> . | 11:12 A.M. | 54. Keller, Harold W. and Kenneth D. Whitney. (Wright State University and University of North Carolina). The Taxonomic Status of <i>Physarum bogoriense</i> . |
| | | 11:25 A.M. | 55. Mueller, Gregory M. (University of Tennessee, Knoxville). Taxonomically Important Diagnostic Characters in the Genus <i>Loccaria</i> . |

ICHTHYOLOGY AND HERPETOLOGY, SESSION I

Shiloh Room, University Center

Presiding: Melvin L. Warren, Kentucky Nature Preserves Commission.

- | | | | |
|-----------|--|--|--|
| 8:00 A.M. | 56. Schwartz, Frank J. and Randy K. Avent. (University of North Carolina). | | Vertebral Aging of Scaloped Hammerhead, <i>Sphyrna</i> |
|-----------|--|--|--|

lewini, and Seven Other Sharks from North Carolina by Silver Nitrate and Crystal Violet Staining Methods.

- | | |
|--|--|
| <p>8:13 A.M. 57. Rosa-Molinari, E., C. S. Williams and S. Collard. (Tuskegee Institute and University of West Florida). Mummification in the Sandbar Shark, <i>Carcharhinus milberti</i> (Muller and Henle).</p> <p>8:26 A.M. 58. Branstetter, Steven. (Dauphin Island Sea Lab). Potential for a Shark Fishery in the Northern Gulf of Mexico.</p> <p>8:39 A.M. 59. Teaf, Christopher M. and Thomas C. Lewis. (Florida State University). Seasonal Occurrence of Multiple Caudal Spines in the Atlantic Stingray, <i>Dasyatis sabina</i>.</p> <p>8:52 A.M. 60. MacGregor, Robert, III and John Finucane. (University of Alabama, Birmingham and National Marine Fisheries Service). Correlations Among Serum Testosterone, Estrogens, GSI and Gonadal Stages in King Mackerel, <i>Scomberomorus cavalla</i>, and Other Scombrids from the Northeast Gulf of Mexico.</p> <p>9:05 A.M. 61. Crampton, Carole. (University of South Alabama). A Seven Month Study of the Ichthyoplankton Population (September-March) in the Upper Mobile Bay.</p> <p>9:18 A.M. 62. Greeley, Mark S. and Robert MacGregor, III. (University of Alabama, Birmingham). Semilunar Spawning Cycle of the Gulf Killifish, <i>Fundulus grandis</i>, from an Alabama Salt Marsh.</p> <p>9:31 A.M. 63. Courtenay, Walter R., Jr., Jeffrey N. Taylor and James A. McCann. (Florida Atlantic University and U.S. Fish and Wildlife Service). New Records and Range Expansions of Exotic Fishes in Florida.</p> <p>9:44 A.M. 64. Warren, Melvin L., Jr. (Kentucky</p> | <p>9:57 A.M. Break</p> <p>10:07 A.M. 65. Carmichael, Gary J. (Memphis State University). Effects of Channelization and Clearing on the Fishes in the Obion and Forked Deer Drainage Systems of Western Tennessee.</p> <p>10:20 A.M. 66. Shute, John R., Peggy W. Shute and David G. Lindquist. (University of North Carolina at Wilmington). Fishes of the Waccamaw System.</p> <p>10:33 A.M. 67. O'Neil, Patrick E. and Maurice F. Mettee. (Geological Survey of Alabama). Fishes of the Western Lignite Region in Alabama.</p> <p>10:46 A.M. 68. Thompson, Bruce A., Steven J. Levine and Linda Deegan. (Louisiana State University). Temporal Analysis of the Fish Community Structure in Bayou St. John, Lake Pontchartrain, Louisiana.</p> <p>10:59 A.M. 69. Shrode, Joy B. (University of Georgia). Egg Production of a Repeat Spawning Freshwater Fish.</p> <p>11:12 A.M. 70. DeChant, Thomas F. and Jerry L. West. (Western Carolina University). Characteristics of Wild Brown Trout (<i>Salmo trutta</i>) Redds.</p> <p>11:25 A.M. 71. Grindstaff, Steve and Jerry L. West. (Western Carolina University). A Comparison of Brook Trout (<i>Salvelinus fontinalis</i>) Embryo Survival and Emergence in a Heavily Silted and Relatively Unsilted Stream.</p> <p>11:38 A.M. 72. Schramm, Joan and Donald Tarter. (Marshall University). Age and Growth of the Black Bullhead, <i>Ictalurus melas</i> (Rafinesque). From an Oxbow Pond in Southern West Virginia.</p> |
|--|--|

PARASITOLOGY, SESSION I

Room 221, University Center

Presiding: Dr. Sharon Patton, University of Tennessee.

- | | |
|--|--|
| <p>9:05 A.M. 73. Mattis, Tom E. (Tusculum College). The Life-cycle of <i>Prochistianella hispida</i> (Linton, 1890).</p> | <p>9:18 A.M. 74. Thye, Cynthia C. and W. I. Current. (Auburn University). Comparison of Annual Prevalence of</p> |
|--|--|

- Two Species of *Myxobolus* and a Trematode Metacercaria (*Uvelifer ambloplitis*) in the Striped Shiner, *Notropis chrysoccephalus*. 9:57 A.M. 77. DeMont, D. J. and Frederic Bryan. (North Carolina State University and Louisiana State University). Population Ecology of *Octospi-niferoides chandleri*.
- 9:31 A.M. 75. Booker, O. J. and W. L. Current. (Auburn University). Ultrastruc-ture of *Chloromyxum trijugum* in the Redear Sunfish (*Lepomis mi-crolophus*) and Bluegill (*Lepomis macrochirus*). 10:10 A.M. 78. Rabinowitz, Alan and Vicki Ma-jor. (University of Tennessee). *Tetrapetalonema llewellyni* from Raccoons of Cades Cove, Great Smoky Mountains National Park.
- 9:44 A.M. 76. Lowrance, Jon H. (Middle Ten-nessee State University). Hel-minth Parasites of Largemouth Bass *Micropterus salmoides* from Radnor Lake, Tennessee. 10:23 A.M. 79. Major, Vicki and Alan Rabino-witz. (University of Tennessee). Ticks from Raccoons of Cades Cove, Great Smoky Mountains National Park.

THURSDAY AFTERNOON—APRIL 9

CHROMOSOME STRUCTURE AND FUNCTION

Auditorium, University Center

Symposium organized by J. K. Shull and M. Y. Menzel and sponsored by Association of Southeastern Biologists.

Part I

Chairperson: Dr. J. K. Shull, Loyola University.

- 1:00 P.M. Abraham I. Grossman, Florida State University. Pathways of Sex Chromosome Evolution in Digenetic Trematodes. 2:45 P.M. C. B. Gillies, University of Syd-ney and Duke University Medical Center. Attempts at Spreading Synaptnemal Complexes in Plants.
- 1:45 P.M. Terry Ashley, University of Ten-nessee. The Arrangement of Chromosomes in Interphase Nu-clei. 3:30 P.M. Irwin M. Greenblatt, University of Connecticut. Genetic Tests of Chromosome Replication: Trans-posible Elements in Maize.
- 2:30 P.M. Break

ANIMAL ECOLOGY

Room 223, University Center

Presiding: Dr. Gary F. McCracken, University of Tennessee.

- 1:00 P.M. 80. McCracken, Gary F. (University of Tennessee). Self-fertilization in the White-lipped Land Snail, *Tri-dopsis albobabris*. 1:26 P.M. 82. Winstead, Joe E. (Western Ken-tucky University). Comparative Caloric Values of Arthropods in Young and Older Ecosystems.
- 1:13 P.M. 81. McCauley, D. E. and James Ott. (Vanderbilt University). Dispers-al Patterns and the Potential for Gene Flow Among Populations of *Tetraopes tetraophthalmus*. 1:39 P.M. 83. Tcare, Catherine A., Joseph F. Scheiring and D. Gale Davis. (University of Alabama). Effects of Larval Crowding on Life His-tory Parameters in *Drosophila melanogaster*.

- 1:52 P.M. 84. MacCormack, Alan. (University of North Carolina). Foundress Associations in *Polistes exclamans*.
- 2:05 P.M. 85. Grenier, Michelle, Luther Brown and David McCauley. (George Mason University and Vanderbilt University). Assortative Mating in the Soldier Beetle, *Chauliognathus pennsylvanicus*.
- 2:18 P.M. 86. Brown, Luther and Blair Siegfried. (George Mason University and Lock Haven State College). Functional Significance of Horn Size in the Forked Fungus Beetle, *Bolitotherus cornutus*.
- 2:31 P.M. 87. Abraham, Barbara J. (Eastern Kentucky University). The Guild Concept in Spider Ecology.
- 2:44 P.M. 88. Tietjen, William James. (Georgia College). Sanitary Behavior by the Social Spider *Mallos gregalis* Simon: Distribution of Excreta as Related to Web Density and Animal Movements.
- 2:57 P.M. Break
- 3:02 P.M. 89. Ash, Andrew N. (East Carolina University). The effect of Clear-cutting on Populations of *Plethodon jordani* and *P. glutinosus*.
- 3:15 P.M. 90. Gowan, Don W. (University of Southwestern Louisiana). Comparison of Avifaunal Populations in a Swamp and Bottomland Deciduous Forest in Southwestern Louisiana.
- 3:28 P.M. 91. Parker, Kathleen C. (University of Wisconsin and University of Georgia). The Influence of Vegetation Structure on Resource Partitioning and Diversity of Desert Bird Communities.
- 3:41 P.M. 92. Whedbee, E. D. and A. N. Ash. (East Carolina University). Estimating Population Size in Winter Blackbird Roosts.
- 3:54 P.M. 93. Brown, Richard D., Deborah B. Hahn and Gregory C. Cornwell. (University of North Carolina at Charlotte). Songs of the Northern Parula Warbler (*Parula americana*).
- 4:07 P.M. 94. Seagle, Steven W. (University of Tennessee and Oak Ridge National Laboratory). Microhabitat Partitioning by Small Mammals in Cedar Glade and Deciduous Forest Habitats.
- 4:20 P.M. 95. Kitchings, J. Thomas and Steven W. Seagle. (Oak Ridge National Laboratory and University of Tennessee). Microhabitat Selection and Competition by Small Mammals in a Pine Forest.
- 4:33 P.M. 96. Baumgardner, George D. (Memphis State University). Intraspecific Variation in the Red-backed Vole (*Clethrionomys gapperi*) from the Southern Appalachian Mountains.
- 4:46 P.M. 99. Stringham, Stephen F. (University of Tennessee). Rates of Reproduction & Recruitment in Grizzly/Brown Bear Populations as a Function of Adult Male Abundance.

AQUATIC ECOLOGY, SESSION I

Room 224, University Center

Presiding: Gary L. Larson, U.S. National Park Service.

- 1:00 P.M. 100. Benson, Kimberly Boster and Donald C. Tarter. (Marshall University). A Comparative Study of Succession as it Proceeds in Four Artificially-constructed Farm Ponds in Cabell County, West Virginia.
- 1:13 P.M. 101. Wickstrom, Glenda C. and Conrad E. Wickstrom. (Emory University). Nitrogen Fixation During Development of a Thermal Algal-Bacterial Mat Community.
- 1:26 P.M. 102. Halcomb, Gary L. and Joseph F. Scheiring. (The University of Alabama). Effects of Chironomids on Phosphorus Release from Sediments of Lake Harris, Tuscaloosa County, Alabama.
- 1:39 P.M. 103. Tietjen, William L. and Jack C. Carter. (Georgia Southwestern

- College). Phosphorus Uptake by a River Swamp System.
- 1:52 P.M. 104. Littrell, James W. and Joseph F. Scheiring. (The University of Alabama). Effects of Strip-mine Drainage on Leaf-litter Processing in a Small Woodland Stream.
- 2:05 P.M. 105. Polovino, H. N., M. P. Farrell, C. H. Pennington, and R. H. Strand. (Oak Ridge National Laboratory and Waterways Experiment Station). Evaluation of Community Information Indices.
- 2:18 P.M. 106. Calkins, John. (The University of Kentucky). Quantitation of the Role of Solar Ultraviolet Radiation (Solar UV) on Aquatic Ecosystems.
- 2:31 P.M. 107. Dundee, Dee, Roy Giardina and Gary Swindler. (University of New Orleans). Response of Non-fouling Organisms to Organotin Antifouling Paints.
- 2:44 P.M. 108. O'Quinn, Ruth. (Mississippi State University). A Taxonomic and Statistical Analysis of Diatom Community Structure in a Calcareous Mississippi Stream.
- 2:57 P.M. Break
- 3:07 P.M. 109. Kalinsky, Robert G. (Louisiana State University in Shreveport). Some Aspects of the Periphytic Diatom (Bacillariophyta) Community in Cypress Bayou Reservoir, Louisiana.
- 3:20 P.M. 110. Cooper, Charles M. and Luther A. Knight, Jr. (USDA Sedimentation Laboratory and University of Mississippi). Macroenthos of Ross Barnett Reservoir, Mississippi.
- 3:33 P.M. 111. Doolittle, Bill. (University of Tennessee). Population Dynamics and Community Structure of Littoral Zooplankton in Lake Itasca, MN.
- 3:46 P.M. 112. Nicholson, Richard B., Donald S. Cherry, James R. Clark and John Cairns, Jr. (Virginia Polytechnic Institute and State University). Structural and Functional Measurements Utilized to Assess the Impact of Coal Ash Effluents upon Aufwuchs Communities.
- 3:59 P.M. 113. Silsbee, David G. and Gary Larson. (Great Smoky Mountains National Park). Physical and Chemical Characteristics of Streams in the Great Smoky Mountains National Park.
- 4:12 P.M. 114. Mathews, Raymond C. Jr. and Gary L. Larson. (Great Smoky Mountains National Park). A Study of the Interrelationship of Acid Precipitation, Stream System Dynamics, and pH Depression Toxicology.
- 4:25 P.M. 115. Moore, Stephen E., Bromfield Ridley and Gary L. Larson. (Great Smoky Mountains National Park). Changes in Standing Crop of Brook Trout Concurrent with Removal of Exotic Trout Species from Selected Great Smoky Mountains National Park Streams.

ICHTHYOLOGY AND HERPETOLOGY, SESSION II

Room 226-7, University Center

Presiding: Dr. David G. Lindquist, University of North Carolina at Wilmington.

- 1:00 P.M. 116. Hardman, Curtis H. (Marshall University). Notes on spawning of the Brindled Madtom, *Noturus munitus* Jordan, in a West Virginia Stream.
- 1:13 P.M. 117. Trauth, Stanley E., Gary L. Miller and John S. Williams. (Georgia Southwestern College, Mississippi State University and University of Alabama). Seasonal Gonadal Changes and Population Structure of *Noturus munitus* in Mississippi.
- 1:26 P.M. 118. Miller, Gary L. and John S. Williams. (Mississippi State University and University of Alabama). Trophic Ecology of the Freckled-belly madtom, *Noturus munitus*.
- 1:39 P.M. 119. Monaco, Paul J., Ellen M. Rasch, and Joseph S. Balsano. (East

- Tennessee State University and University of Wisconsin-Parkside). Cytophotometric Determinations of DNA During Gametogenesis in *Poecilia*.
- 1:52 P.M. 120. Drysdale, Dale T. (University of West Florida). Histological Examination of Intersexual Mosquitofish, *Gambusia affinis*.
- 2:05 P.M. 121. Bortone, Stephen A. and Dale T. Drysdale. (University of West Florida). Additional Evidence for Environmentally Induced Intersexuality in Poeciliid Fishes.
- 2:18 P.M. 122. Snelson, Franklin F. Jr. (University of Central Florida). Temporal Pattern of Maturation in the Male Sailfin Molly, *Poecilia latipinna*.
- 2:31 P.M. 123. Davis, Drew and David C. Heins. (Millsaps College). Reproduction of the Weed Shiner, *Notropis texanus*, in Southeastern Mississippi.
- 2:44 P.M. 124. Utter, P. S. and J. S. Ramsey. (Auburn University). A Systematic Study of an Unusual Population of the Coldwater Darter, *Etheostoma ditrema*, in Shelby Co., Alabama.
- 2:57 P.M. Break
- 3:07 P.M. 125. Stiles, Robert and Larry Eldridge. (Samford University). An Aquarium Study of Social Behavior of the Blackbanded Darter, *Percina nigrofasciata*.
- 3:20 P.M. 126. Eldridge, Larry. (Samford University). The Reproductive Behavior of *Percina nigrofasciata*.
- 3:33 P.M. 127. Wieland, Werner. (Auburn University). Food habits of the Blackbanded Darter, *Percina nigrofasciata*, in the Cahaba River, Alabama.
- 3:46 P.M. 128. Lindquist, David G., John R. Shute and Peggy W. Shute. (University of North Carolina at Wilmington). Spawning and Nesting Behavior in the Waccamaw Darter, *Etheostoma perlongum*.
- 3:59 P.M. 129. Jones, L. Michael, David G. Lindquist, J. R. Shute and P. W. Shute. (University of North Carolina at Wilmington). Spawning Success of the Waccamaw Darter, *Etheostoma perlongum*, Under Artificial Substrates.
- 4:12 P.M. 130. Shute, Peggy W., John R. Shute and David G. Lindquist. (University of North Carolina at Wilmington). Age, Growth, and Larval Development of the Waccamaw Darter, *Etheostoma perlongum*.
- 4:25 P.M. 131. Swindoll, C. Michael. (University of Tennessee). Growth, Diet and Distribution of Yellow Perch Fry, *Perca flavescens* (Mitchill) in Lake Itasca, Minnesota.
- 4:38 P.M. 132. Wallace, Richard K. Jr. (Auburn University). Diet Overlap Between the Mississippi Silverside (*Menidia audens*) and Juvenile Largemouth Bass (*Micropterus salmoides*) in False River, Louisiana.

PLANT SYSTEMATICS, SESSION I

Room 225, University Center

Presiding: Dr. Eugene Wofford, University of Tennessee.

- 1:00 P.M. 133. Watson, Frank D. (North Carolina State University). Pond Cypress, *Taxodium ascendens* Brongn. or *T. distichum* (L.) Rich. var. *nutans* (Ait.) Sweet?
- 1:13 P.M. 134. Weber, R. Michael. (North Carolina State University). Reproduction in *Saxifraga careyana*, *Saxifraga caroliniana* and *Saxifraga michauxii*.
- 1:26 P.M. 135. King, Bruce L. and Samuel B. Jones. (Randolph-Macon College and University of Georgia). Flavonoid Study of South American *Vernonia*: Series Flexuosae.
- 1:39 P.M. 136. Nesom, Guy L. (Memphis State University). Chasmogamy and Cleistogamy in *Chaptalia vernalis*.

- 1:52 P.M. 137. Curtis, John D. and Nels R. Lersten. (University of Wisconsin-Stevens Point and Iowa State University). Occurrence and Anatomy of Hydathodes in *Phytoscarpus*.
- 2:05 P.M. 138. Wallace, James W. (Western Carolina University). GLC Identification of Monosaccharides.
- 2:18 P.M. 139. Wallace, James W. (Western Carolina University). The Use of C-glycosylxanthones as Phylogenetic Markers within the Leptosporangiate Ferns and Their Allies.
- 2:31 P.M. 140. Porter, Pat and James W. Wallace. (Western Carolina University). C-glycosylflavones of Representative Species of the Gnetales.
- 2:44 P.M. 141. Davenport, L. J. (University of Alabama). A Numerical Taxonomic Study of Western Hemisphere *Hydrolea*.
- 2:57 P.M. 142. Thompson, Ralph L. (Berea College). A Revision of the Leguminous Genus *Lysiloma*.
- 3:10 P.M. Break
- 3:15 P.M. 143. Smith, Gerald L. (University of Georgia). Revision of *Pittocarpha* R. Br. in Peru.
- 3:28 P.M. 144. MacLeish, Nanda F. (University of Georgia). Systematics of *Eremanthus* Less.
- 3:41 P.M. 145. Lassetter, Stuart and Sudaratana Veerasethakul. (Eastern Kentucky University). Karyotype Relationships in Native New World *Vicia*.
- 3:54 P.M. 146. Stutts, John G. (The University of Georgia). Flavonoids of Vernoniaeae: Taxonomic Value.
- 4:07 P.M. 147. Kowalczyk, Bruno F. and Jeanne Stuart. (The University of South Carolina). The Use of Polygonal Diagrams in a Phylogenetic Study of the Gentianaceae.
- 4:20 P.M. 148. Reynolds, John D. and Peter E. Giebel. (Virginia Commonwealth University). The Separation of Closely Related Fungi by Infrared Spectrophotometry.
- 4:33 P.M. 149. Pilatowski, R. E. (Ohio State University). A Taxonomic Study of the *Hydrangea arborescens* Complex.
- 4:46 P.M. 150. Kowalczyk, Bruno F. and J. M. Herr, Jr. *Conohea* Aubl. and Related Taxa: A Preliminary Survey.
- 4:46 P.M. 151. Huck, Robin B. (University of North Carolina). Nomenclatural History of *Dicerandra*.

PLANT ECOLOGY, SESSION I

Shiloh Room, University Center

Presiding: Dr. Dennis Whigham, Smithsonian Institution.

- 1:00 P.M. 152. Whigham, Dennis and Deborah Orbach. (Smithsonian Institution). Ecological Studies of an Old-field Weed *Ipomoea hederacea*.
- 1:13 P.M. 153. Carter, M. Eloise Brown and William H. Murdy. (Agnes Scott College and Emory University). Divergence of Flowering Time in *Talinum*.
- 1:26 P.M. 154. DuBay, Denis T. and William H. Murdy. (Emory University). The Effect of High Relative Humidity and SO₂ on the Sexual Reproduction of *Talinum teretifolium*.
- 1:39 P.M. 155. Murdy, William H. (Emory University). The Effects of SO₂ on Sexual Reproduction in *Talinum mungesii* Wolf Plants Pollinated by Few Pollen Grains.
- 1:52 P.M. 156. Sutter, Robert and Laura Mansberg. (North Carolina Department of Agriculture and North Carolina State University). Collection Pressure, Population Structure and Survival of Ginseng (*Panax quinquefolium*) in North Carolina: A Preliminary Report.
- 2:05 P.M. 157. Weiss, T. Edward, Jr. (Christopher Newport College). Phyllodia in the Pitcher Plant *Sarracenia flava* L.
- 2:18 P.M. 158. Sharitz, Rebecca R. (Savannah River Ecology Laboratory). De-

- mographic Studies of Camphorweed, *Heterotheca subaxillaris*.
- 2:31 P.M. 159. Frame, Daniel and Katharine B. Gregg. (West Virginia Wesleyan College). Pollinators of the Orchid *Platanthera (Habenaria) ciliaris* (L.) Lindley.
- 2:44 P.M. Break
- 2:59 P.M. 160. Gregg, Katharine B. (West Virginia Wesleyan College). Reproductive Biology of the Orchid *Platanthera (Habenaria) ciliaris* (L.) Lindley in a Wet Meadow in West Virginia.
- 3:12 P.M. 161. Whipple, Stephen A. and James V. LaFrankie. (Louisiana State University). The Relationship of Time of Emergence to Survivorship, Growth and Reproduction in the Annual Grass *Rottboellia exaltata* L. f.
- 3:25 P.M. 162. Anderson, Roger C. (Illinois State University). Influence of Cold Stratification and Temperature on the Germination of *Tripsacum dactyloides*.
- 3:38 P.M. 163. Anderson, Roger C. (Illinois State University). The Growth of *Tripsacum dactyloides* L. Under Various Levels of Inorganic Nutrients.
- 3:51 P.M. 164. Lindsey, Anne H. and C. Ritchie Bell. (University of North Carolina). Wasp Pollination in *Oxyopilis*.
- 4:04 P.M. 165. Bell, C. Ritchie and Anne H. Lindsey. (University of North Carolina). Floral Structure and Differential Insect Visitation in Two Sympatric Species of *Osmorhiza*.
- 4:17 P.M. 166. Farmer, Janis M. (University of North Carolina). Pollination Efficiency and Fruit Set in *Asclepias syriaca* L.

FRIDAY MORNING—APRIL 10

ECOSYSTEMS OF THE SOUTHERN APPALACHIAN HIGHLANDS

Auditorium, University Center

Session II

Chairperson: Dr. A. E. Echternacht, University of Tennessee.

- | | | |
|-----------|--|--|
| 8:00 A.M. | Chairperson's Remarks | J. Alsup, III, East Tennessee State University |
| 8:03 A.M. | Aquatic Systems: David Etnier, University of Tennessee | 9:58 A.M. Break |
| 8:48 A.M. | Cave Systems: John R. Holzinger, Old Dominion University | 10:15 A.M. Aboriginal and Recent Man, and the Naiad Fauna: Paul W. Parmalee, University of Tennessee |
| 9:23 A.M. | Terrestrial Animals—Birds: Fred | 10:50 A.M. Discussion |

CYTOLOGY, GENETICS AND DEVELOPMENTAL BIOLOGY

Room 223, University Center

Presiding: Dr. Joseph C. Daniel, Jr., University of Tennessee.

- | | | | |
|-----------|--|-----------|---|
| 8:00 A.M. | 167. Smith, Maury and Harriett E. Smith. (The University of Alabama). Food Vacuole Membrane Recycling in the Ciliate, <i>Tetrahymena vorax</i> . | 8:13 A.M. | 168. Herr, J. M., Jr. (University of South Carolina). Essential and Often Neglected Features of the 4'2 Clearing Technique. |
| | | 8:26 A.M. | 169. Henzler, David J. (Savannah River) |

- er Ecology Laboratory and West Virginia Wesleyan College). Enzyme Activity Levels in the Mosquitofish, *Gambusia affinis* (Baird and Girard).
- 8:39 A.M. 170. Evans, P. T. and E. A. Rupert. (Clemson University). In Vitro Culture of Embryos Obtained through Inter- and Intraspecific Cross-pollinations in the Genus *Trifolium*.
- 8:52 A.M. 171. Collier, Paula A., Larry W. Jones and Karen W. Hughes. (University of Tennessee). *Physcomitrella patens*: A Potential Tool for Genotoxicity Testing.
- 9:05 A.M. Break
- 9:20 A.M. 172. Robertson, J. L. and D. I. Pav. (East Tennessee State University). Ethyl Alcohol Consumption and its Effect on Blastema Formation in Rabbit Ears.
- 9:33 A.M. 173. Daniel, Joseph C., Jr. and Amin A. El-Banna. (University of Tennessee). Tissue Specificity in Endometrial Grafts to Rabbit Ears.
- 9:46 A.M. 174. Hamlett, W. C., J. S. Hudson and J. P. Wourms. (Clemson University). Ultrastructural Analysis of Protein Absorption in the Shark Yolk-sac Placenta.
- 9:59 A.M. 175. Harrison, Frederick W. (Western Carolina University). Application of Acridine Orange as a Vital Fluorochrome During Dormancy Release and Development from Gemmules in *Spongilla lacustris* L.
- 10:12 A.M. 176. Harrison, Frederick W. and Doris A. Davis. (Western Carolina University). Morphological Patterns During Early Stages of Reduction Body Formation in *Spongilla lacustris* L.
- 10:25 A.M. 177. Benner, D. B. (East Tennessee State University). A Pattern Duplication on Wings of *Drosophila melanogaster*.
- 10:38 A.M. 178. Egar, Margaret W., Janet McCredie and Marcus Singer. (Case Western Reserve University and the University of Sydney, Australia). Cartilage Regeneration in Partially Denervated Newts.

INVERTEBRATE ZOOLOGY

Room 224, University Center

Presiding: Dr. Charles E. Jenner, University of North Carolina, Chapel Hill.

- 9:00 A.M. 179. Jenner, Charles E. and Thomas H. Fox. (University of North Carolina and North Georgia College). Evolution of Cryptogonochorism in Commensal Bivalves.
- 9:13 A.M. 180. Vidrine, Malcolm F. and Darryl R. Clark. (Jefferson Davis Parish Mosquito Abatement District Number 1 and The University of Southwestern Louisiana). A Characterization of a Fresh-water Mussel Bed in a River in South Central Louisiana.
- 9:26 A.M. 181. McClung, R. Michael and Paul E. Lutz. (University of North Carolina at Greensboro). Influences of Environmental Factors on the Adult Behavior of *Ladonna deplanata*.
- 9:39 A.M. 182. Dodd, C. Kenneth Jr. (U.S. Fish and Wildlife Service). Probable Extinction of Two Species of Flatworms in Northern Virginia.
- 9:52 A.M. 183. Dimock, Ronald V. Jr. (Wake Forest University). In Defense of the Harem: Intraspecific Aggression by Male Water Mites.
- 10:05 A.M. 184. Vidrine, Malcolm F. (Jefferson Davis Parish Mosquito Abatement District Number 1). A Comparison of the Acarine Subgenera *Neotax* and *Polytax*.
- 10:18 A.M. 185. Fitzmayer, Karen M., James G. Geiger, and Michael J. Van Den Avyle. (Technological University and U.S. Fish and Wildlife Service). Chronic Effects of Simazine on *Daphnia pulex*.
- 10:31 A.M. 186. Mamaril, Augustus. (Mississippi State University and The University of The Philippines). Current Status of Freshwater Zooplank-

ton Taxonomy and Distribution in the Philippines.

- 10:44 A.M. 187. Clamp, John C. (North Carolina State Museum of Natural History

and North Carolina State University). Three Species of *Lagenophrys* Symbiotic on North American Crayfish.

PLANT PHYSIOLOGY

Room 221, University Center

Presiding: Dr. P. A. Collier, University of Tennessee.

- | | | | |
|-----------|---|------------|---|
| 8:00 A.M. | 188. Collier, P. A. and L. W. Jones. (University of Tennessee). Light Dependence of <i>Myriophyllum spicatum</i> L. Seed Germination. | 9:31 A.M. | 195. Harris, Joseph B., Verlyn G. Schaefer, and Jerome P. Miksche. (University of Wisconsin-Stevens Point and North Carolina State University). Changes in DNA and Other Constituents of the Aging <i>Zea</i> Leaf. |
| 8:13 A.M. | 189. Reynolds, John D., Bruce Weekly and T. D. Kimbrough. (Virginia Commonwealth University). A New Micro-method for the Extraction and Assay of Plant Serotonin (5-Hydroxytryptamine). | 9:44 A.M. | 196. Tryba, Sue E., John H. Yopp, and Robert A. Young. (Southern Illinois University). Comparative Analysis of Seed Protein Profiles from Five Populations of <i>Crotalaria sagittalis</i> L. Using Isoelectric Focusing. |
| 8:26 A.M. | 190. Zeckmeister, Michael T. (University of Wisconsin-Stevens Point). Structure and Distribution of the Secretion Glands of <i>Grindelia squarrosa</i> . | 9:57 A.M. | Break |
| 8:39 A.M. | 191. Bell, John M. (University of Wisconsin-Stevens Point). A Developmental Study of Secretory Trichomes of <i>Comptonia asplenifolia</i> L. Aiton. | 10:07 A.M. | 197. Bowden, Sandra T. (Agnes Scott College). Studies of the Morphogenesis of Gametophytes of the Moss <i>Polytrichum commune</i> . |
| 8:52 A.M. | 192. Steffens, John C., David G. Lynn and J. L. Riopel. (University of Virginia). Biochemistry of Host Recognition by <i>Agalinis purpurea</i> . | 10:20 A.M. | 198. Toman, F. R. and Miguel Sandoval. (Western Kentucky University). The Effects of Certain Growth Retardant Chemicals on Chlorophyll Levels of Tomatoes and Soybeans. |
| 9:05 A.M. | 193. Montain, Cheryl R. (University of Wisconsin-Stevens Point). Developmental Anatomy of Adventitious Root Primordium Initiation in <i>Pinus banksiana</i> Seedling Cuttings. | 10:33 A.M. | 199. Creek, Robert. (Eastern Kentucky University). Investigation of IAA and Other Indolic Compounds in Green Algae. |
| 9:18 A.M. | 194. Huang, F. H. (University of Arkansas). Organogenesis of Scotch Pine by Tissue Culture. | 10:46 A.M. | 200. Cropper, W. P. Jr. and H. L. Ragsdale. (Emory University). Lead Uptake and Translocation in <i>Ailanthus altissima</i> Seedlings. |

PLANT SYSTEMATICS, SESSION II

Room 226-7, University Center

Presiding: Dr. Gene S. Van Horn, University of Tennessee, Chattanooga.

- | | | | |
|-----------|--|-----------|---|
| 8:00 A.M. | 201. Porcher, Richard D. (The Citadel). Endangered and Threatened Vascular Plants of the Francis Marion National Forest, S.C.: Part I. | 8:12 A.M. | 202. Porcher, Richard D. (The Citadel). |
|-----------|--|-----------|---|

- del). Endangered and Threatened Vascular Plants of the Francis Marion National Forest, S.C.: Part II.
- 8:24 A.M. 203. Fairey, John E. III, Caroline C. Douglass and Walter C. Credle. (Clemson University). The Vascular Flora of the Proposed Basin of The Richard B. Russell Lake.
- 8:36 A.M. 204. Wiersema, John H. (University of Alabama). New Records for *Nymphaea* Taxa in Tropical and Subtropical America.
- 8:48 A.M. 205. Bates, Vernon M. Jr., and Edward T. Browne, Jr. (Memphis State University). *Azolla filiculoides* Lamarck, New to the Southeastern United States.
- 9:00 A.M. 206. Douglass, Caroline C. (Clemson University). *Waldsteinia lobata* (Baldw.) T. & G. Verified for South Carolina.
- 9:12 A.M. 207. White, Peter S. (National Park Service). Rarity: The Case for Vascular Plants at Great Smoky Mountains National Park.
- 9:24 A.M. 208. Van Horn, Gene S. (University of Tennessee at Chattanooga). The Vascular Plant Flora of Amnicola Marsh.
- 9:36 A.M. 209. Cranfill, Raymond. (University of Michigan). Floristics of the North Central Mississippian Plateau in Kentucky.
- 9:48 A.M. 210. Jones, Samuel B. Jr. (The University of Georgia). The Responsibilities of Plant Systematists in the 1980's.
- 10:00 A.M. 211. Jones, Ronald L. (Vanderbilt University). The Status of *Aster phlogifolius* Muhl.
- 10:12 A.M. Break
- 10:24 A.M. 212. Nesom, Guy L. and Charles R. Werth. (Memphis State University). Further Studies of Variation in *Galax*.
- 10:36 A.M. 213. Meigs, Russell A. (University of Alabama). Phenotypic Variability of *Carex* Section *Ovales* in Alabama.
- 10:48 A.M. 214. Mellichamp, T. Lawrence. (University of North Carolina at Charlotte). Reproductive Biology of *Nestronia umbellula*, a Threatened Southeastern Plant.

PLANT SYSTEMATICS, SESSION III

Room 225, University Center

Presiding: Dr. D. K. Smith, University of Tennessee.

- 10:00 A.M. 215. Matthews, James F. (University of North Carolina at Charlotte). A Study of a Hybrid Population of *Sarracenia flava* × *S. purpurea* in an Upland Habitat.
- 10:12 A.M. 216. Jones, S. B. and S. C. Keeley. (The University of Georgia, Whit-tier College, and Natural History Museum of Los Angeles County). Distribution of Pollen Types in *Vernonia*.
- 10:24 A.M. 217. Beckmann, Robert L. Jr., and Jon M. Stucky. (North Carolina State University). Extrafloral Nectaries and Plant Guarding in *Ipomoea pandurata* (L.) G. F. W. Mey.
- 10:36 A.M. 218. Horn, Charles N. (University of Alabama). Morphological Variation in *Heteranthera dubia*.
- 10:48 A.M. 219. Lane, David M. (University of Georgia). Intraplant Variation in Two Varieties of *Sphagnum macrophyllum*.

PARASITOLOGY, SESSION II

Room 225, University Center

Presiding: Dr. Jeffrey A. Butts and Mr. Bruce Lindemann, Univ. N.C., Charlotte.

- 8:00 A.M. 220. Foster, Lewis A. and Burton J. Bogitsh. (Vanderbilt University). Fate of [³H] aminolaevulinic Acid-Labeled Hemoglobin in *Schisto-*

soma mansoni Schistosomules *In Vitro*.

- | | |
|---|---|
| <p>8:13 A.M. 221. Bogitsh, B. J. (Vanderbilt University). Cytochemical Observations on the Golgi Complex of <i>Schistosoma mansoni</i>.</p> <p>8:26 A.M. 222. Hornick, Frederic R. (University of South Carolina). Preliminary Studies of the Immune Response of <i>Canis</i> sp. to Experimental Challenges of <i>Trichuris vulpis</i> and Hookworm sp.</p> <p>8:39 A.M. 223. Butts, Jeffrey A. and Donald C. Schrum. (University of North Carolina at Charlotte). <i>Dirofilaria immitis</i> Microfilariae in the Blood of Dogs in the Absence of Adult Heartworms.</p> <p>8:52 A.M. 224. Mathis, Greg and Larry R. McDougald. (University of Geor-</p> | <p>gia). Evidence for Phylogenetic Influence on Host Specificity of <i>Eimeria</i> in Interspecific Hybrid Hosts.</p> <p>9:05 A.M. 225. Lindsay, David S. (Auburn University). Endogenous Development of the Swine Coccidium <i>Isospora suis</i> Biester 1934.</p> <p>9:18 A.M. 226. Scholtens, Robert G. and Sandra Johnson. (University of Tennessee). <i>Giardia</i> and Parakeets.</p> <p>9:31 A.M. 227. Patton, Sharon. (University of Tennessee). <i>Dicheilonema rheae</i> from a Common Rhea at The Knoxville Zoological Park.</p> <p>9:44 A.M. 228. Mobley, Ronald W. and Grover C. Miller. (North Carolina State University). The Gastro-intestinal Helminths of Some Sea Birds from North Carolina.</p> |
|---|---|

PLANT ECOLOGY, SESSION II

Shiloh Room, University Center

Presiding: Dr. L. S. Barden, University of North Carolina at Charlotte.

- | | |
|---|---|
| <p>8:00 A.M. 229. Stalter, Richard. (St. John's University). Some Ecological Observations of Delaware Forests.</p> <p>8:13 A.M. 230. McDonald, Charles B. and Andrew N. Ash. (East Carolina University). Vegetation Mapping in Tyrrell County, North Carolina.</p> <p>8:26 A.M. 231. Horton, James H. and Garrett A. Smathers. (Western Carolina University). Frying Pan Gap Oak Orchard Study: Age of the Stand.</p> <p>8:39 A.M. 232. Sullivan, Joseph H., J. Dan Pittillo, and Garrett A. Smathers. (Erskine College and Western Carolina University). Dispersal and Establishment of Red Spruce and Fraser Fir in the Balsam and Craggy Mountains.</p> <p>8:52 A.M. 233. Pittillo, J. Dan and Garrett A. Smathers. (Western Carolina University). Vegetational Patterns of the Balsam and Great Smoky Mountains of the Southern Appalachians.</p> <p>9:05 A.M. 234. Campbell, Julian J. N. (University of Kentucky). Gradient Analysis of Appalachian Forest: A Review Plus Further Analysis.</p> | <p>9:18 A.M. 235. Romme, William H. and William H. Martin. (Eastern Kentucky University). Natural Disturbance by Tree-Fall Gaps in Old Growth Mixed Mesophytic Forest in Eastern Kentucky.</p> <p>9:31 A.M. 236. Barden, L. S. (University of North Carolina at Charlotte). Forest Development in Canopy Gaps of a Diverse Hardwood Forest of the Southern Appalachians.</p> <p>9:44 A.M. Break</p> <p>9:54 A.M. 237. Delcourt, Hazel R., Paul A. Delcourt, and Allen M. Solomon. (Oak Ridge National Laboratory and University of Tennessee). Forest History for the Last 12,000 Years at Cahaba Pond, St. Clair Co., Alabama.</p> <p>10:07 A.M. 238. Perkins, Bretta E. and H. R. DeSelm. (University of Tennessee). Sandstone Outcrop Plant Communities of the Cumberland Plateau in Tennessee and Northern Alabama: The Vascular Plants.</p> <p>10:20 A.M. 239. Jones, Ron L. and Peter S. White. (Vanderbilt University and U.S. National Park Service). Vegeta-</p> |
|---|---|

- tion and Flora of Shiloh National Military Park, Tennessee.
- 10:33 A.M. 240. Bushey, Charles L. (Southern Illinois University). Vegetational Analysis of *Acer saccharum* Dominated Communities in Southern Illinois.
- 10:46 A.M. 241. Young, M. Louise. (Southern Illinois University). An Analysis of the Herbaceous Vegetation along Moisture and Temporal Gradients in a Southern Illinois Floodplain Forest.

FRIDAY AFTERNOON—APRIL 10

CHROMOSOME STRUCTURE AND FUNCTION

Auditorium, University Center

Part II

Chairperson: Dr. Margaret Y. Menzel, Florida State University.

- | | | | |
|-----------|---|-----------|---|
| 1:00 P.M. | Ada L. Olins, University of Tennessee—Oak Ridge Graduate School of Biomedical Sciences and Biology Division, Oak Ridge National Laboratory. Structural Organization of Chromatin. | 2:30 P.M. | Break |
| | | 2:45 P.M. | Peter Lally, Oak Ridge National Laboratory. Genetic Analysis Using Somatic Cell Hybrids and Gene Transfer Techniques. |
| 1:45 P.M. | J. H. Taylor, Florida State University. The Control of Replication in Eucaryote Chromosomes. | 3:30 P.M. | Laurence D. Etkin, University of Tennessee. Expression of Sea Urchin Histone Genes in <i>Xenopus laevis</i> Eggs and Oocytes. |

AQUATIC ECOLOGY, SESSION II

Room 225, University Center

Presiding: Dr. Virginia Tolbert, Oak Ridge National Laboratory.

- | | | | |
|-----------|---|-----------|---|
| 1:00 P.M. | 242. Whitaker, James B., Donald S. Cherry, David A. Stetler, and John Cairns, Jr. (Virginia Polytechnic Institute and State University). Behavioral Avoidance, Toxicity and Histological Changes of Rainbow Trout (<i>Salmo gairdneri</i>) Exposed to Acidic and Basic pH Conditions. | 1:39 P.M. | 245. Brown, Susan. (Georgia Southern College). The Occurrence of Juvenile Grouper, <i>Mycteroperca microlepis</i> in Estuarine Waters. |
| 1:13 P.M. | 243. Miller, W. Roscoe III. (Virginia Polytechnic Institute and State University). The Effects of Short-term Chlorine Exposure on Rainbow Trout (<i>Salmo gairdneri</i>) Blood Chemistry. | 1:52 P.M. | 246. Clark, Darryl R. (University of Southwestern Louisiana). Growth and Secondary Production of the Oligohaline Barnacle <i>Balanus subalbidus</i> Henry Settling on Hester-Dendy Artificial Fouling Plates in a Tidal Louisiana Lake Receiving a Heated Effluent. |
| 1:26 P.M. | 244. Stair, David M. Jr., Virginia R. Tolbert, and Gerald L. Vaughan. (Science Applications Inc., Oak Ridge National Laboratory, and | 2:05 P.M. | 247. Price, James O. (Memphis State |

- University). Observations on the Trophic Ecology of the Crayfish *Orconectes neglectus chaenodactylus*.
- 2:18 P.M. 248. Leung, Tat-Sing, Syed M. Naqvi and Nusrat Z. Naqvi. (Southern University). Paraquat Toxicity to Freshwater Copepods and Red Crayfishes (*Procambarus clarkii*) of Louisiana.
- 2:31 P.M. 249. Hanley, Robert W., Gordon R. Ulsch and Frank G. Nordlie. (University of Alabama and University of Florida). Oxygen Consumption in Relation to Ambient Oxygen Tension in Five Species of Freshwater Snails.
- 2:44 P.M. Break.
- 2:54 P.M. 250. Dundee, Dee and Gary C. Swindler. (University of New Orleans). Investigation of a Suspended Culture of *Crassostrea virginica*.
- 3:07 P.M. 251. Bishop, T. Dale and C. T. Hackney. (University of Southwestern Louisiana and University of North Carolina at Wilmington). Seasonal Abundance of Molluscs in Two Mississippi Brackish Tidal Marshes.
- 3:20 P.M. 252. Jeffreys, Donald B., Milbrey Cate, Linda P. Hemingway, and Bernard E. Kane, Jr. (East Carolina University). Assimilation in the Estuarine Clam, *Rangia cuneata*, After Uptake of *Serratia* and *Euglena*.
- 3:33 P.M. 253. O'Dillon, Carol J. and S. D. Caldwell. (Georgia College). Insect Colonization of Leaf Packs in a Small Stream.
- 3:47 P.M. 254. LaSalle, Mark W. (University of Southwestern Louisiana). Parasitism of the Dragonfly *Ceuthemis epouina* by Water Mite Larvae.
- 4:00 P.M. 255. Tarter, Donald, William Morris and Dwight Chaffee (Marshall University). Ecological Life History of *Baetisca berneri* Tarter and Kirchner from a West Virginia Stream.
- 4:13 P.M. 256. Lechleitner, Richard A., Donald S. Cherry, John Cairns, Jr. and David A. Stetler. (Virginia Polytechnic Institute and State University). The Effects of Fly Ash on Three Species of Stonefly Nymphs.
- 4:26 P.M. 257. Nelson, Charles H. (University of Tennessee at Chattanooga). Notes on the Post-diapause Life History of Two Species of Taeniopterygidae with a Description of the Mature Nymphs.

ICHTHYOLOGY AND HERPETOLOGY, SESSION III

Room 220, University Center

Presiding: **Dr. Frank J. Schwartz**, University of North Carolina, Inst. of Marine Sciences.

- 1:00 P.M. 258. Mettee, Maurice F., Patrick E. O'Neil and Danny Wilson. (Geological Survey of Alabama). A Data Analysis and Retrieval System for Environmental Resources (DARTER).
- 1:13 P.M. 259. Menhinick, Edward F. and Norman F. Innes. (University of North Carolina at Charlotte). A Computerized Approach to the Handling of Vertebrate Collection Data.
- 1:26 P.M. 260. Nelson, David H. (University of South Alabama). Growth and Development of Larval *Rana utricularia* at Constant and Fluctuating Temperatures.
- 1:39 P.M. 261. Ireland, Patrick H. (Radford University). Taxonomic Problems in the *Eurycea longicauda* Complex.
- 1:52 P.M. 262. Pav, D. L., J. L. Robertson, and H. J. Araya. (East Tennessee State University). Comparison of Long Bone Development in two Salamander Species, *Plethodon glutinosus* and *Desmognathus quadrimaculatus*.
- 2:05 P.M. 263. Marion, Ken R. and Roger J. McPherson. (University of Alabama in Birmingham). The Female Reproductive Cycle of *Sternotherus odoratus* in Central Alabama.

- 2:18 P.M. 264. McPherson, Roger J. and Ken R. Marion. (University of Alabama in Birmingham). Seasonal Lipid Changes in *Sternotherus odoratus* Related to Reproduction and Maintenance.
- 2:31 P.M. 265. Mitchell, Joseph C. (University of Richmond and University of Tennessee). Size, Age Structure and Sex Ratios in Populations of the Freshwater Turtles *Chrysemys picta* and *Sternotherus odoratus* in Virginia.
- 2:44 P.M. Break
- 2:54 P.M. 266. Henwood, A. Terry. (Auburn University). Loggerhead Sea Turtles, *Caretta caretta* Captured in Port Canaveral, August through November, 1980.
- 3:07 P.M. 267. Frazer, Nat B. (University of Georgia). Correlation of Nesting Attempts of the Atlantic Loggerhead, *Caretta caretta*, with Tidal Cycles: A Final Word?
- 3:20 P.M. 268. Schwartz, Frank J., Charles Peterson, Hugh Passingham, John Fridell, and Julian Wooten. (University of North Carolina and U.S. Marine Corps Base, Camp Lejeune). First Successful Nesting of the Green Sea Turtle, *Chelonia mydas* in North Carolina and North of Georgia.
- 3:33 P.M. 269. Dodd, C. Kenneth Jr. (U.S. Fish and Wildlife Service). Infrared Reflectance in Chameleons.
- 3:46 P.M. 270. Vitt, Laurie J. (University of Georgia). Lizard Reproduction: Habitat Specificity and Constraints on Relative Clutch Mass.
- 3:59 P.M. 271. McKinney, Rose B. and Ken R. Marion. (University of Alabama at Birmingham). Seasonal Spermatogenic and Androgen Cycles in the Lizard *Sceloporus undulatus* in North Central Alabama.
- 4:12 P.M. 272. Wade, Julia and A. C. Echternacht. (University of Tennessee). A Comparative Study of Reproductive Cycles in Two Populations of *Anolis carolinensis*.
- 4:27 P.M. 273. Forks, Thomas P. and Sam W. Rosso. (The University of Southern Mississippi). SEM and Histological Observation on Ecdysis in Terrestrial and Aquatic Snake Genera.
- 4:40 P.M. 274. White, David R., Joseph C. Mitchell and William S. Woolcott. (University of Richmond). Reproductive Cycle of *Nerodia taxipilota* at the Northeastern Edge of its Range.

TEACHING METHODS

Room 221, University Center

Presiding: Dr. Wendell E. Wall, University of Alabama in Birmingham.

- 1:00 P.M. 275. Wall, Wendell E. (University of Alabama in Birmingham). The Correlation of Selected Predictors with Student Performance in Introductory Biology Courses.
- 1:13 P.M. 276. Hillier, David and Charley M. White. (University of Wisconsin-Stevens Point). Niche Partitioning and Rearrangement in an Undergraduate Advanced Ecology Curriculum.
- 1:26 P.M. 277. Dindo, John and Johnny Booker. (Dauphin Island Sea Lab). Marine Awareness, A High School Approach to Marine Science.
- 1:39 P.M. 278. Burnham, Kenneth D. (University of Tennessee). The Enhancement of a Course in Bioethics by Utilizing Non-science Literature.
- 1:52 P.M. 279. Franke, R. G. (University of Tennessee at Chattanooga). Values Education: Attitudes of Biology Teachers in Tennessee Colleges and Universities.
- 2:07 P.M. 280. Bradley, Carolyn F. (Macon Junior College). The Effects of Imagery Stimulation on Achievement in College Biology.
- 2:20 P.M. 281. Yeany, Russell H., Edwin A.

Helseth, and William E. Barstow. (University of Georgia). Predicting College Biology Achievement Aptitude, Logical Thinking Abil-

2:33 P.M.

ity, and Other Student Entry Characteristics.

282. Koch, William J. (University of North Carolina). Learning Through Teaching.

PLANT ECOLOGY, SESSION III

Room 223, University Center

Presiding: Dr. Frank P. Day, Jr., Old Dominion University.

- | | | | |
|-----------|--|-----------|---|
| 1:00 P.M. | 283. Hall, Jerry F. and Samuel P. Faulkner. (Mississippi State University). Primary Production and Elemental Composition of <i>Scirpus olneyi</i> in a Mississippi Coastal Marsh. | 2:31 P.M. | |
| 1:13 P.M. | 284. Bradshaw, H. David and Mark M. Brinson. (East Carolina University). Assimilative Capacity of the Sediment-water System of a Riverine Tupelo-cypress Swamp under Sustained Nutrient Loading. | 2:45 P.M. | 290. Box, Elgene O. (University of Georgia). Biomass and Litter Accumulations in the Southeastern United States. |
| 1:26 P.M. | 285. Faulkner, Samuel P. and Armando A. de la Cruz. (Mississippi State University). Nutrient Mobilization Following Winter Fires in an Irregularly Flooded Marsh. | 2:59 P.M. | 291. Stout, Judy P. and Armando A. de la Cruz. (University of South Alabama and Mississippi State University). In Situ Decomposition of Dead Tissues of Selected Tidal Marsh Plants. |
| 1:39 P.M. | 286. Jones, Jon D., Thomas M. Williams and George R. Askew. (Clemson University). Lowland Forest Site Conversion and Water Quality: Experimental Design and Techniques. | 3:12 P.M. | 292. McLeod, Kenneth W. and Casey Sherrod, Jr. (Savannah River Ecology Laboratory). Decomposition of Longleaf Pine Litter. |
| 1:52 P.M. | 287. Wickland, Diane E. and Laura Mansberg. (University of North Carolina, Savannah River Ecology Laboratory, and North Carolina State University). Nutrient and Heavy Metal Concentrations in Plants from Olivine Outcrops and Derelict Mine Sites in North Carolina. | 3:25 P.M. | 293. Yates, Frederick K. and Frank P. Day, Jr. (Old Dominion University). Comparison of Decay Rates of Confined Versus Unconfined Litter in The Great Dismal Swamp. |
| 2:05 P.M. | 288. Workman, Sarah W. and Kenneth W. McLeod. (Western Washington University and Savannah River Ecology Laboratory). Fire and Nutrient Turnover in the Sandhills Turkey Oak (<i>Quercus laevis</i>) Association, South Carolina. | 3:38 P.M. | 294. Atchue, J. A. III. and Frank P. Day, Jr. (Old Dominion University). The Effect of Benthic Algae on Nitrogen and Phosphorus Cycling in a Cypress Stand in The Great Dismal Swamp, Virginia. |
| 2:18 P.M. | 289. Pinder, John E. III. and Tim A. Christiansen. (Savannah River Ecology Laboratory). The Effects of Residual Fertilizer on Net Pro- | 3:51 P.M. | 295. Day, Frank P. Jr. (Old Dominion University). A Microcosm Study of Effects of Flooding on Litter Decomposition. |
| | | 4:04 P.M. | 296. Bandle, Bruce J. and Frank P. Day, Jr. (Old Dominion University). Site Variation in Foliage Nutrients in The Great Dismal Swamp. |
| | | 4:17 P.M. | 297. Haeuble, Garry G., Steven M. Jones, and B. Allen Dunn. (Clemson University). Phytogeographical and Compositional Character- |

- istics of the *Quercus oglethorpensis* Duncan Population in South Carolina.
- 4:31 P.M. 298. Jones, Steven M. and David H. Van Lear. (Clemson University). Hardwood Communities of the Savannah River Plant in Aiken, Barnwell, and Allendale Counties, South Carolina.
- 4:44 P.M. 299. Perry, James E. and Frank P. Day Jr. (Old Dominion University). A Vegetational Analysis of the Northeastern North Carolina Outer Bank's Marshes.

PLANT ECOLOGY, SESSION IV

Room 224, University Center

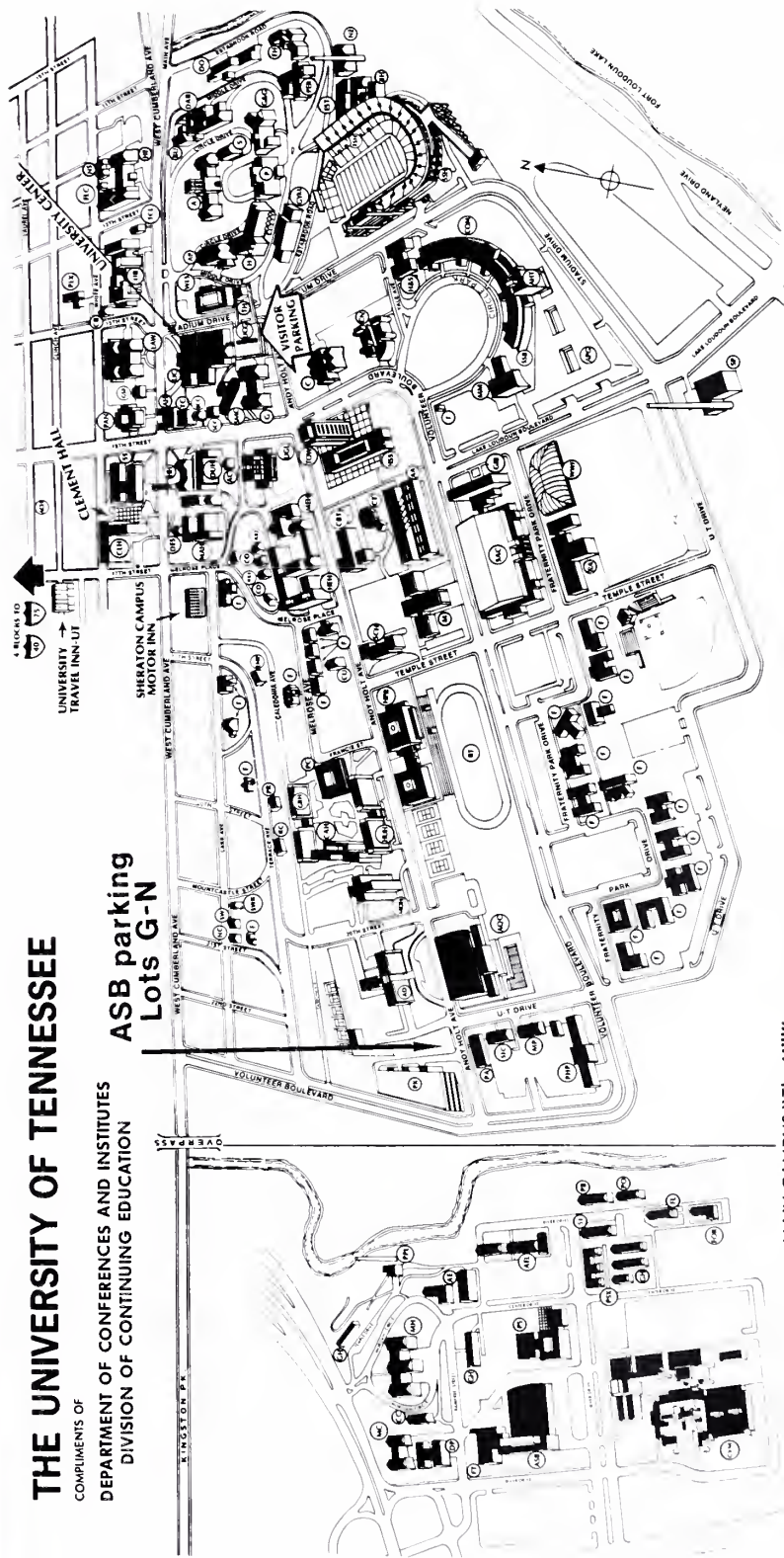
Presiding: Dr. Raymond A. McCord, University of Tennessee.

- 1:00 P.M. 300. Boring, Lindsay, Carl Monk, and Wayne Swank. (University of Georgia and U.S. Forest Service). Forest Regeneration on a Clear-cut Appalachian Watershed.
- 1:13 P.M. 301. McCord, Raymond A. and Clifford C. Amundsen. (The University of Tennessee). Experimental Revegetation of Maritime Tundra with Dune Grass, *Elymus mollis*.
- 1:26 P.M. 302. Feldkamp, Susan M. (University of Tennessee). Revegetation of Upper Elevation Debris Slide Scars on Mt. Le Conte in the Great Smoky Mountains National Park.
- 1:39 P.M. 303. Pavlovic, Noel B. and Edward E. C. Clebsch. (University of Tennessee). Seed Rain and Seed Banks in the Vicinity of the Spruce-fir and Gray Beech Ecotone in the High Elevation Smoky Mountains.
- 1:52 P.M. 304. Manek, Wanda B. (University of Tennessee). The Role of Seed Bank Germinants in Succession Occurring in a Riparian Ecosystem at Cove Lake, Caryville, Tennessee.
- 2:05 P.M. 305. Cameron, Randall G. and David Troilo. (University of Georgia and City College of New York). Fly-mediated Spore Dispersal in *Splachnum ampullaceum*.
- 2:18 P.M. 306. Busing, Richard T. and Edward E. C. Clebsch. (University of Tennessee). The Effects of Vegetation Height and Density Biomass Allocation in Field Herb Populations.
- 2:31 P.M. Break
- 2:45 P.M. 307. Neufeld, Howard S. (University of Georgia). Effects of Shading on the Growth of Seedlings of Bald Cypress (*Taxodium distichum* (L.) Rich.) and Pond Cypress (*Taxodium ascendens* Brong.).
- 2:59 P.M. 308. McCaffrey, Cheryl A. (Savannah River Ecology Laboratory and University of Georgia). Flooding Effects on Survival and Growth Rates of *Ludwigia leptocarpa* (Onagraceae) at Four Growth Stages.
- 3:12 P.M. 309. Sharma, G. K. and Christy Cooper. (University of Tennessee at Martin). Environmental Pollution and Variations in *Platanus occidentalis* L. (Platanaceae).
- 3:25 P.M. 310. Gross, Louis J. (University of Tennessee). Photosynthetic Dynamics of *Fragaria virginiana* and Carbon Gain.
- 3:38 P.M. 311. Baskin, Jerry M. and Carol C. Baskin. (University of Kentucky). Ecophysiology of secondary dormancy in seeds of *Ambrosia artemisiifolia*.
- 3:51 P.M. 312. Luvall, Jeffrey C., Christopher Uhl, and Carl F. Jordan. (University of Georgia). Transpiration in Native Tropical Forests Converted to Pine.
- 4:04 P.M. 313. Parker, Albert J. (University of Georgia). Vegetation Dynamics in Forests of Glacier National Park, Montana.

THE UNIVERSITY OF TENNESSEE

COMPLIMENTS OF
DEPARTMENT OF CONFERENCES AND INSTITUTES
DIVISION OF CONTINUING EDUCATION

ASB parking
Lots G-N



AGRICULTURAL CAMPUS

- A — Agricultural Engineering Bldg
- AE — Agricultural Engineering Lab
- ASB — CE Beam Animal Sciences Bldg
- C — College of Veterinary Medicine
- DM — Dairy Products Bldg
- FL — Food Research Laboratory
- FT — J. H. McLeod Food Technology Bldg
- GH — Greenhouse
- MA — Morgan Hall
- MB — Berry Hall
- PD — Perry D. Sprague Laboratory
- PS — Englewood Plant Sciences
- SP — Spring Lab

MAIN CAMPUS "The Hill"

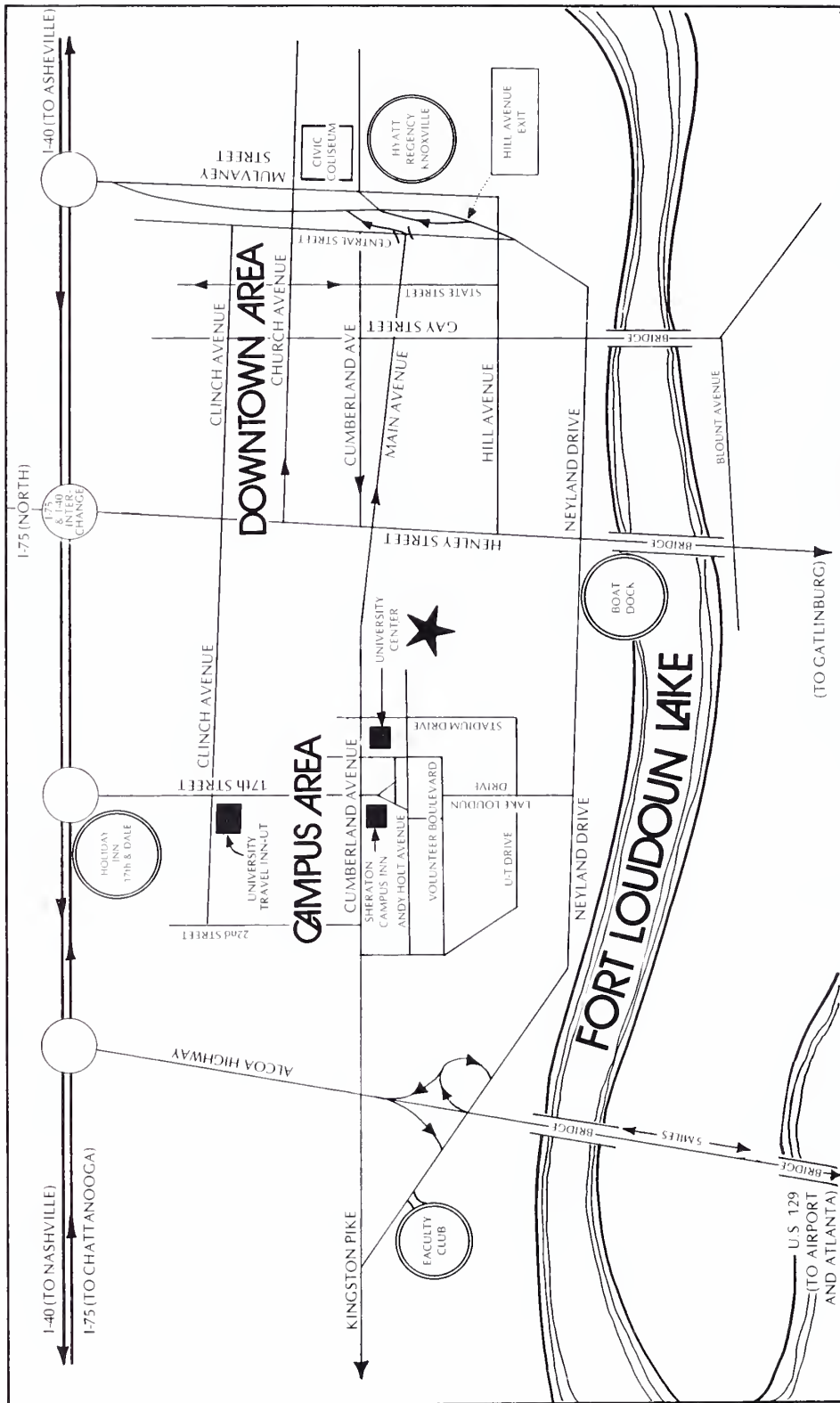
- A — Ayres Hall (Liberal Arts)
- AA — Art & Arch Bldg (under construction)
- ACH — Arts & Crafts House (Laurel House)
- AD — Holt Ave Apartments
- ADP — Administration, Parliament Offices
- ANT — Antioch Tower
- AP — Austin Pres Memorial Bldg (Porch)
- APG — Administration Parking Garage
- A1 — Art Annex 1
- A2 — Art Annex 2
- B — Baker Hall
- BCC — Baker Cultural Center
- BM — Berry Hall
- BT — Tom Baker
- BU — Buchanan Hall
- C — Clanton Education Building
- CAH — Carrick Hall (Residence)
- CD — Communications Design (Brick House)

- CLH — Clement Hall (Residence)
- CO — Communications and Conferences
- COM — Communications and University Extension Bldg
- CT — Casual Theatre
- CU — Credit Union
- CAB — Dabney Hall
- DUR — Durrant Hall (Residence)
- DO — Dougherty Engineering Bldg
- EST — Embrock Hall (Architecture)
- EMP — Employment Office
- FR — Fraternity House
- FLC — Family Life Center
- G — Gossett Business Administration Bldg
- GRB — Gibbs Hall (Residence)

- GRH — Greer Hall (Residence)
- GSP — Graduate School of Planning
- GM — Alumni Memorial Auditorium-Gymnasium
- H — Hester Biology Bldg
- HAS — Harris Hall (Residence)
- HEH — Hees Hall (Residence)
- HHS — Henson Hall (Residence)
- HHS — Humanities and Social Sciences Bldg
- HM — Information Booth
- LAW — George C. Taylor Law Center
- MAH — Main Library (Main Library)
- MAH — Massey Hall (Residence)
- MAH — Melrose Hall (Residence)
- MDH — Morrell Hall (Residence)

- MP — Motor Pool
- MC — Motor Control Programs
- NS — Nursing School
- NS — Nurses School
- PA — Physics Building
- PAN — Pantheons Building
- PC — Presidential Court Bldg
- PH — Physical Plant
- PK — Parking Garage
- PL — Planning School Annex
- RA — Army Reserve Training Center
- RC — Reading Center
- SC — South College (Psychology)
- SAC — William B. Stucky Athletics Center
- SCC — Counseling Center
- SCN — Student Clinic & Hospital

- SEC — Safety & Security, 1115 UT Drive
- SEC — Safety Management Center
- SS — Stephens Strong Hall (Residence and Cafeteria)
- SSB — South Stadium Hall
- SP — (Office of Rental Properties)
- SPW — School of Social Work Knoxville Branch
- TCL — Textiles & Clothing Lab
- TC — Temple Court
- TOW — McClung Tower
- UC — Carolyn P. Brown Memorial University
- UGO — Johnson Center Parking Garage
- UGO — John C. Hoggan Undergraduate Library
- WWF — Winter Workshop Facility



ABSTRACTS OF PAPERS PRESENTED AT THE 42ND ANNUAL MEETING OF THE ASSOCIATION OF SOUTHEASTERN BIOLOGISTS KNOXVILLE, TENNESSEE

The number in parenthesis at the top of each abstract refers to the number of that paper in the Program.

(Ecosyst. Symp.)

Vegetation of the Southern Blue Ridge Province

Arthur W. Cooper

North Carolina State University

Vegetation of the Southern Blue Ridge Province has been studied by botanists and ecologists for over 200 years. Floristic elements, including endemics, tropical, southeastern, northern, and wide-ranging species, have been identified. Deciduous forests dominate below 5000–5500 feet. These include cove hardwood forests on the most mesic sites, hemlock forests along streams, oak forests on the open slopes, and pine forests on ridges and steep, dry slopes. Over 4500–5000 feet, spruce-fir forests cover the peaks and slopes of the higher mountains, with deciduous forests, containing a number of northern species, on open slopes and in gaps. Treeless communities (balds) also are present in the spruce-fir zone. Heath balds occur on steep, rugged sites and grassy balds occupy more subdued peaks, gaps, and ridges. Interpretations of these vegetation patterns must take into account results of new research on the Pleistocene history of the southeast.

(Ecosyst. Symp.)

History of the Biota on the Southern Appalachian Highlands

Paul A. Delcourt and Hazel R. Delcourt

*University of Tennessee and
Oak Ridge National Laboratory*

The Southern Appalachian Highlands today harbor many endemic species that classically were thought to be derived from the biota of the Tertiary Period. However, fossil pollen and macrofossil data show that major displacements in species ranges have occurred in eastern North America in response to climatic changes during the Quaternary. Broad patterns of vegetation distribution through the last 40,000 years are documented for this region. Gradients in composition of floral and faunal assemblages are examined from full-glacial times to the present. Due to their NE-SW orientation, the Appalachians have not obstructed the dispersal and establishment of many upland taxa. However, these highlands have been a migrational barrier for taxa requiring aquatic habitats. Man has become a significant ecological factor in the Appalachians since the arrival of Paleoindians 12,000 years

ago. Over the past 200 years, settlement by the white man has resulted in the widespread alteration of Appalachian ecosystems through land clearance, introduction of pathogens and exotic species, and recreational use of remaining tracts. *Research supported by the National Science Foundation, Ecology Program, under contract no. DEB80-04168 with the University of Tennessee; and by the National Science Foundation, Ecosystem Studies Program, under Interagency Agreement No. DEB-77-26722 with the U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation.*

(Ecosyst. Symp.)

Vegetation of the Mixed Mesophytic Forest Region and Its Relationship to Selected Environmental Factors

C. Ross Hinkle

Science Applications, Inc., Oak Ridge, Tennessee

The area defined as the Mixed Mesophytic Forest Region lies, for the most part, within the boundaries of the unglaciated portion of the Appalachian Plateaus Province. Recent studies on a major part of this physiographic province, the Cumberland Plateau of Tennessee, show that the predominant vegetation cover is characteristically mixed oak forests on flat to rolling uplands and richer oak forests on slopes of the dissected surface. Vegetation similar to that classically characterized as Mixed Mesophytic is restricted to middle and lower slopes of the most highly dissected plateau. Major environmental factors related to the plant community distribution on the upland are soil depth, slope position, and available water, while the major factors in the gorges and ravines are soil pH, bedrock type, soil nutrient, slope position, and the ratio of gorge depth to width. Other plant communities and soil-site relationships throughout the Mixed Mesophytic Forest Region are summarized from literature sources to further characterize the vegetation.

(2)

Let the Untold Secrets Unfold

F. W. Woods and Bill Moschler

University of Tennessee

Even though large amounts of information have been extracted from tree rings, it is only a fraction of that which can be obtained. Types of information that

tree rings can yield, other than ring width and density, are discussed.

(3)

The Implications of Acid Rain to Eastern Dendroclimatology

Larry J. Puckett

U.S. Geological Survey

Acid rain has occurred in sections of the eastern United States since the early 1950's. In a preliminary investigation tree-ring chronologies from southeastern New York were analyzed for changes in growth responses which might be attributed to acid rain. Results indicate a more significant relationship between tree growth and climate beginning about 1950. It is interesting that the degree to which this change occurred varied among the four species, *Tsuga canadensis*, *Pinus rigida*, *Pinus strobus*, and *Quercus prinus*. The implications of such a change may pose problems for future work in Eastern dendroclimatology. It may no longer be assumed that the growth-climate relationship has remained constant. Therefore in some areas the calibration period may have to be limited to pre-acid rain data (i.e. before 1950). Until the exact nature and magnitude of this problem are established future dendroclimatic studies should take this factor into consideration.

(4)

Dendroclimatic Research in Southern Greenland

Merlin P. Lawson and Karl C. Kuivinen

University of Nebraska-Lincoln

Dendrochronological research in Greenland has met with only qualified success in the last two decades. No dendroclimatic interpretations have resulted from these initial efforts. During the summer of 1978, field work was conducted to sample stands of birch (*Betula pubescens*) in a uniquely fertile, isolated valley known as Qinguadalen (60°16'N, 40°30'W). Although the birch suffered considerable geomorphic stress, conventional dendroclimatic procedures revealed significant growth response to climate. Trees generally exhibited contorted or near-horizontal stems, producing asymmetry in the pith-to-bark dimensions with severe tendency to develop heart rot. Of the 35 trees sampled, the oldest datable stem was 143 years. Growth response functions derived from eigenvector analysis of meteorological data at Ivigtut demonstrated as much as 42% of the variance could be explained by climate and 28% by prior growth. Although the longevity of the Qinguadalen birch chronology is relatively poor, it does contain considerable information concerning the relationship between climatic variables and tree growth for the area.

(5)

Reconstruction of Streamflow on the Occoquan River, Virginia

Richard L. Phipps

U.S. Geological Survey

Monthly values of streamflow on the Occoquan River, 1841-1975, have been estimated from tree-ring rec-

ords. Seven collections representing six species at various sites in northern Virginia were collectively calibrated with existing streamflow records for each month, April through August. Variance in the streamflow data which was explained by stepwise multiple regression procedures ranged from 41 percent for April to 53 percent in May. Generalizations from the reconstructed data indicate that since the 1840's no decade has had as great amounts of streamflow as the 1940's. During four other periods since 1841, the number of months of low streamflow per decade was as great as during the dry 1960's. However, during only one of the periods, 1865-1875, were there as few months of high streamflow as during the 1960's.

(6)

Dendrochronological Evidence of Rock Sliding in Central Appalachia

Cliff R. Hupp

U.S. Geological Survey

Analysis of increment cores and cross sections of trees growing on or near land slides can yield accurate dates of rock sliding. Frequency and magnitude of geomorphic activity can be inferred from dates of movement. Talus slopes, with patches of block field and forest, have been studied for dates and rates of block field movement. Dates of movement on the block fields correlate with gaging station records of high flows on Passage Creek which drains the study area in Massanutten Mountain, northwestern Virginia. Block fields in Appalachia have been previously considered stable relicts of Pleistocene climate. Information from tree-ring studies shows that block fields are active today. Most block field movement occurs in coves where runoff is concentrated. Studies indicate that slope failure in cove areas may be of such frequency that periodic landslide disturbance may play an important role in cove forest pattern and process.

(7)

Dendroclimatology of White Oak (*Quercus alba*) in Iowa

D. N. Duveck

Oak Ridge National Laboratory

Ring-width chronologies from living white oaks (*Quercus alba*) at three sites in central Iowa were used to reconstruct annual precipitation and July Palmer Drought Severity Indices (PDSI) for the last 300 years. Variations in ring width due to competition changes were removed by fitting a curve to each ring width series. Ring widths at each site vary directly with the total amount of precipitation over the 12 months preceding completion of ring formation, and vary inversely with spring and summer temperature. Linear regression based on data for 1920-1979 was used to reconstruct August-July precipitation and July PDSI. Correlations of actual and reconstructed values of each variable exceeded 0.72 for the 1920-1979 period and also for 46 years of independent data prior to 1920. The response of white oak ring width to moisture stress is identifiable and strong enough to permit reconstructions of past climate. Research sponsored by the National Science Foundation, Ecosystem Studies Program, under Interagency Agreement DEB77-26722

(8)

A New Version of the Gamma Ray Densitometer

Bill Moschler and F. W. Woods
University of Tennessee

A gamma ray densitometer using an Fe⁵⁵ source, a scintillation counter, and a linear carriage has been modified to provide greater flexibility. This machine can be used to measure both ring width and within ring specific gravity. Data is generated in digital form ready to store in a computer. Density measurements may be made on a linear distance as small as 20 microns. Applications of this technique to dendrochronology are currently being investigated.

(9)

Using a Gamma Densitometer to Analyze a Loblolly Pine Thinning Study

Deborah D. McRae
University of Tennessee

An even-aged loblolly pine (*Pinus taeda* L.) thinning study is being analyzed to determine the effects of thinning levels on the quality of wood. A gamma densitometer, utilizing ⁵⁵Fe as a radiation source, was used to scan thin sections of increment cores to measure ring width, latewood density, earlywood density, average density, and percent latewood before and after thinning. These values will be compared with a control and an analysis of variance will determine whether a significant variation due to thinning level is evident. A continuous scan by the densitometer across the period of treatment allows the estimation of regression curves as well as mean densities to be used in the analysis.

(10)

Estimating Past Climatic Conditions Using Tree Rings in the Eastern United States

T. J. Blasing and Darrell C. West
Oak Ridge National Laboratory

Ring-width chronologies developed from white oak (*Quercus alba*) and shortleaf pine (*Pinus echinata*) have been used to reconstruct a 300-year record of late-spring precipitation in eastern Tennessee. Other investigators have used different species to provide information about past climate for several locations in the eastern United States. Many of the methods used are similar to those developed for work in the arid southwest, but there are some important differences. Notably, temporal changes in competitive status affect ring width, and these effects must be considered in analyses of eastern tree rings. Dendroclimatic studies throughout the eastern United States are useful to climatologists and dendroecologists interested in long-term variations in large-scale climatic features, and their role in forest response to both biotic and abiotic stress. Research sponsored by the National Science Foundation, Ecosystem Studies Program, under Interagency Agreement DEB77-26722 with the U.S.

(12)

Tree-ring Network Collections in the Central United States

David W. Stahle, John G. Hehr,
and Graham G. Hawks
University of Arkansas

There is an increasing need for a geographic network of modern tree-ring chronologies in the central and eastern United States to serve as a data base for paleoclimatic, ecological, historic, and archeological research. A detailed chronology network has been developed for major portions of the western United States. We have begun a field program to expand the western network into the south-central United States. Following standard dendrochronological techniques, 20 tree-ring chronologies will be developed in Arkansas, north Texas, and Oklahoma during the first year of research. The dendroclimatic suitability of a variety of native species will be evaluated, and site conditions related to longevity and climatic sensitivity will be identified.

(13)

The Effect of Thyroid Hormones or Thiouracil on the Ability of the Young Chick (*Gallus domesticus*) to Withstand Heat Stress

S. J. Bowen and K. W. Washburn
University of Georgia

Three experiments were conducted to study the involvement of the thyroid gland in the response of the young chicken to heat stress. In the first two experiments 3-week-old male meat-type chicks were injected intraperitoneally with 40 µg of L-thyroxine (T₄) or 40 µg 3,5,3' triiodothyronine (T₃) per 100 g of body weight at either 0, 6, 12, 18 or 24 hours before heat stress by exposure to 50°C for 4 hours. In experiment 1 in which T₄ was administered, survival times were 184, 165, 125, 106, 111 and 186 minutes for the treatment groups injected at 0, 6, 12, 18 or 24 hours before heat stress and the control group respectively. For experiment 2 in which T₃ was administered, the mean survival times were 192, 187, 137, 163, 149 and 194 minutes for similar treatment groups. In experiment 3, birds fed a diet containing 0.2% thiouracil 10 days before heat stress at 28 days of age had significantly longer survival times than control birds.

(14)

The Effects of Age on Nuclear Triiodothyronine Binding Sites in Rat Liver

Thomas R. Bauman
University of Alabama

Mammals exhibit a decrease in sensitivity to thyroid hormones with increasing age. The physiological ef-

fects of these hormones are mediated by stimulation of specific nuclear receptor sites in tissues which respond to the hormone. This study will report the effects of increasing age (30 to 300 days) on the affinity and binding of triiodothyronine to rat hepatocyte nuclei.

(15)

⁶⁵Zn-zinc Chloride Retention and Distribution Following Dietary Aflatoxin Treatment in Golden Syrian Hamsters, *Mesocricetus auratus*

**A. Steve Jones, Mike Amos,
and Gerald Llewellyn**

Virginia Commonwealth University

Young, adult male hamsters (*Mesocricetus auratus*) were treated for 40 days with a mixed aflatoxin diet containing 1.6 ppm AFB₁, 0.05 ppm AFB₂, 13.0 ppm AFG₁, and 0.6 ppm AFG₂. On day 28 both control (CON) and aflatoxin (AFT) groups were intubated with 0.1 μ Ci ⁶⁵ZnCl₂ and then sacrificed 12 days later. Whole body retention counts were taken on days 2, 4, 7, 9 and 12 post intubation. A marginal increase in weight gain was observed among CON animals (6.7%), whereas AFT animals showed a steady weight loss (24%). Organ weight data indicated smaller liver and testes in the AFT group. Histopathology of liver revealed cell necrosis and biliary cell proliferation. The combination of these changes indicated onset of aflatoxicosis. A linear decrease in ⁶⁵Zn whole body retention was observed in both groups, but AFT animals retained significantly higher amounts. A decreased retention in the liver, testes, femur, lungs and skin was observed among AFT animals, whereas an increase was seen in the duodenum. The significance of these findings with respect to possible aflatoxin-zinc interaction is discussed.

(16)

Daily Variation of Mouse Blood Cells

Rebecca N. Tabatabai and P. S. Rushton

Memphis State University

Forty-eight DUB-ICR male mice, seven months old, were bled at various times of the day, each week for eight weeks, to study daily variation in blood cells (total white blood cells, white blood cell types, total eosinophils, total red blood cells, percentage of reticulocytes, and hematocrit). No significant daily variation was found in total red blood cells, hematocrit, or percentage of reticulocytes. A significant (*P* less than .001) daily variation was found in total white blood cells, with the minimum occurring at 8 PM and the maximum occurring during the daylight hours from 8 AM to 2 PM. The absolute values of lymphocytes, neutrophils, monocytes, and eosinophils parallel the total white blood cell variation.

(17)

Daily Variation in the Corticosteroid Levels in Mouse Blood

**P. S. Rushton, Rebecca N. Tabatabai,
and Bill Summers**

Memphis State University

Male mice (DUB-ICR) at least six months old were bled at various time intervals for two weeks to measure the level of circulating corticosteroids. Samples from individual mice were evaluated with a competitive protein binding assay which uses radioactive corticosterone, the predominant adrenal hormone in mice. A single daily variation cycle was found with minimum levels occurring in the early morning hours and the maximum at 2 PM. Since these mice are strongly nocturnal, the corticosteroid level is inversely correlated with the activity pattern.

(18)

Geographic Variation of Hemoglobin Gene Frequencies in Cotton Rats, *Sigmodon hispidus*

Charles W. Foreman

University of the South

Wild populations of cotton rats, *Sigmodon hispidus*, show two contrasting hemoglobin genes that exhibit enormous variability of frequencies among seven collection sites in the Southeast and one site in the Southwest. The data suggest a possible correlation of gene frequency with latitude. One gene determines the presence of two electrophoretically separable hemoglobins, and what behaves like an allele determines the presence of a single hemoglobin of intermediate mobility. Present data do not suggest any effects of these genes upon either hematocrits or whole blood hemoglobin concentrations.

(19)

Temperature and Photoperiod Control of Reproduction in Channel Catfish, *Ictalurus punctatus* (Ictaluridae)

**Kenneth B. Davis, Bill A. Simco,
and Pam Torrance**

Memphis State University

The influence of temperature and photoperiod on gonadal development and plasma sex steroid concentrations were evaluated in channel catfish, *Ictalurus punctatus*. Fish spawned in the spring of 1977 were maintained over winter in 1979-80 in ponds in central Alabama, or transferred in January to warm water (21 C) with or without a photoperiod advancement of 15 minutes each day for 2 months. In mid-March, plasma estrogen and testosterone concentrations were determined by radioimmunoassay and compared with the gonadosomatic index (GSI) of each group. Although the GSI of pond fish remained the same from January to March, the GSI of all experimental fish significantly increased during this period. Testosterone concentra-

tions in pond fish increased slightly by March, but only those fish exposed to a combination of increased temperature and photoperiod had sex steroid levels significantly higher than levels found in pond fish. These data suggest that temperature controls spring gonadal growth while the length of the photoperiod may stimulate secretion of the sex steroids.

(20)

General and Specific Physiological Responses of Channel Catfish (*Ictalurus punctatus*) to Elevated Environmental Nitrite

J. R. Tomasso, Bill A. Simco,
and Kenneth B. Davis

Memphis State University

Nitrite, an intermediate product of nitrification, causes the oxidation of hemoglobin to methemoglobin, a form not capable of transporting oxygen. In the presence of nitrite, channel catfish also release corticosteroid hormones into the bloodstream from the interrenal tissue as part of its general response to a stressor. The purpose of this study was to observe the specific (methemoglobinemia) and general (corticosteroid release) physiological responses of channel catfish to environmental nitrite (21–24 C, pH = 6.9–7.1). Fish exposed to 0–5 mg/liter nitrite for 24 hours demonstrated increasing plasma corticosteroid and methemoglobin levels with increasing concentrations of nitrite. Corticosteroid and methemoglobin levels both increased with increasing time of exposure to 5 mg/liter nitrite. Addition of 303 mg/liter chloride to the medium in the presence of 5 mg/liter nitrite prevented the elevation of both corticosteroid and methemoglobin concentrations. The ability of environmental chloride to prevent both methemoglobinemia and elevated plasma corticosteroid levels further supports the hypothesis that chloride acts to competitively prevent environmental nitrite from entering the fish. This study demonstrates a direct relationship between specific and general physiological responses of channel catfish to environmental nitrite.

(21)

The Histology and Histochemistry of Skeletal Components in Paddlefish (*Polyodon spathula*)

Iola T. McClurkin, Andrea K. Miksa,
and Luther A. Knight, Jr.

University of Mississippi

The paddlefish, *Polyodon spathula*, has received little attention although it is one of the larger and most unique North American freshwater fishes. In this study, the nature and composition of its skeletal tissues were examined histologically and histochemically. The endoskeleton in young paddlefish is hyaline cartilage with a sulfated acid polysaccharide matrix. This cartilage lacks a perichondrium and as the fish matures, calcium salts are deposited in the cartilage matrix in the rostrum and chondrocranium. The absence of a perichondrium and the presence of cell

“nests” within the matrix suggest that this endoskeleton can grow only interstitially. A bony dermal exoskeleton covers the chondrocranium and its extension into the rostrum, but not into the vertebral column. This fibrillar, laminated dermal bone matrix contains calcium salts and acid mucopolysaccharides, but these are not sulfated. Dermal bones appear to form by intramembranous ossification with growth occurring appositionally from a periosteum.

(22)

A Survey of Trihalomethanes in the Drinking Water System, Murfreesboro, TN

William B. Kasso and Marion R. Wells

Middle Tennessee State University

Trihalomethanes are compounds formed in drinking water as a result of chlorination of water containing organic compounds. The most abundant trihalomethane, chloroform, has been found to be carcinogenic by the National Cancer Institute. A survey of trihalomethanes was conducted in the Murfreesboro, Tennessee water system to determine levels to which residents were being exposed. Six sites within Murfreesboro, including two water treatment plants, were monitored weekly from December 10, 1979 until August 15, 1980. Samples were analyzed by gas chromatography using liquid-liquid extraction techniques. Total trihalomethane levels were found to be consistently above the 100 ppb ($\mu\text{g/l}$) maximum level established by the Environmental Protection Agency. Seasonal levels were found to be statistically different, with trihalomethane fluctuations correlating with changes in raw water temperature. Significant variations were found in levels according to site location.

(23)

Effect of Aspirin and Exercise on the Modified Ivy and Duke Bleeding Times of College-aged Males

D. A. Olewine, P. A. Currie,
G. M. Beaudreau, M. T. White, D. T. Purdom,
S. T. Tuggle, and C. G. Hames

Georgia Southern College and Evans County
Heart Research Unit

Duke (DBT) and Modified Ivy Bleeding (MIBT) Times were obtained from 25 male volunteers aged 22.0 ± 0.5 yr. ($\bar{x} \pm \text{SE}$) at rest and after exercising 6 min. on a bicycle ergometer at a work load that was 80% of the maximal work capacity of that individual. One week later resting and post-exercise bleeding times were repeated after ingestion of 648 mg of timed-release aspirin/24 hr. Aspirin significantly increased both resting and exercise DBT: Rest— 2.5 ± 0.2 to 3.4 ± 0.3 min., $P = 0.018$; Exercise— 2.3 ± 0.2 to 3.0 ± 0.2 min., $P = 0.018$ and MIBT: Rest— 5.9 ± 0.5 to 7.6 ± 1.0 min., $P = 0.02$; Exercise— 4.5 ± 0.5 to 6.8 ± 0.6 min., $P = 0.007$. Rest vs. Exercise showed no significant differences for either DBT or MIBT. Mean estimated maximal oxygen consumption for the group was 41.7 ml/kg/min. Supported by Georgia Southern College Research Fund and USPH Grant H103341.

(24)

Chemical Characterization of the Lorica
and Extracellular Mucilage of the
Unicellular Green Alga *Phacotus*
lenticularis (Volvocales,
Phacotaceae)

Linda A. Pocratsky and Patricia L. Walne
University of Tennessee

Cells of the green algal flagellate, *Phacotus lenticularis*, are surrounded by a wall-like structure, the lorica, that is composed of overlapping halves and that may be associated with copious amounts of extracellular mucilage. Chemical analyses show that lorica constituents are both organic and inorganic. By weight the lorica is ca. 36% carbohydrate, 26% protein, 4% sulfate; the remaining material comprises various minerals, e.g., Ca, Mn. Elemental analyses by SEM-EDS indicate that lorica mineral composition may vary with culture conditions. Thin layer chromatography reveals glucose as the principal sugar. Chromatographic and colorimetric analyses of the extracellular mucilage indicate that it is glycoprotein in nature and that by weight it is ca. 50% carbohydrate, 12% protein and 16% sulfate; amino acid and TLC analyses indicate hydroxyproline as the principal amino acid. Preliminary experiments with SDS-polyacrylamide gel electrophoresis produce 5–6 major bands and suggest that the mucilage is a high molecular weight substance.

(25)

Spatial Segregation of Manganese and
Iron in the Envelope of *Trachelomonas*
lefevrei (Euglenophyceae)

John R. Dunlap, Larry K. West,
Patricia L. Walne, and James Bentley
University of Tennessee and
Oak Ridge National Laboratory

The wall-like envelope that surrounds *Trachelomonas* may vary in color and ornamentation, depending upon environmental conditions. Previous investigations in this laboratory have shown that it is composed of numerous elements, especially Mn and Fe, and that envelope coloration varies with its elemental composition. To address basic questions of envelope structure and biomineralization in relation to elemental occurrence and distribution, we investigated with STEM-EDS the species *T. lefevrei*, which produces hyaline to dark brown envelopes. The STEM-EDS analyses confirm a spatial segregation of the predominant elements Mn and Fe, and the occurrence of Mn as needle-like microcrystallites. In dark envelopes the major element, Mn, is concentrated along the inner and outer surfaces, whereas the Fe-containing central matrix is typically amorphous. In golden envelopes this mineralization pattern is reversed; Fe-rich regions occur along the surfaces, with higher Mn concentrations in the mid-region. Hyaline envelopes are typically amorphous in structure, with Fe as the major element, and only traces of Mn present.

(26)

Comparative Ultrastructure and Elemental
Composition of Envelopes of
Strombomonas and *Trachelomonas*
(Euglenophyceae)

Patricia L. Walne, John R. Dunlap,
and Peter A. Kivic
University of Tennessee

The erection of the genus *Strombomonas* by Deffandre in 1930, as an entity separate from *Trachelomonas* was based largely on envelope characteristics. Considerable controversy over its taxonomic disposition has ensued, however, with the most recent study relegating it again to a species of *Trachelomonas*. In a reevaluation of the status of *Strombomonas*, we here compare it with 5 species of *Trachelomonas*. Like *Trachelomonas*, envelopes of *S. conspersa* are variable in color, ranging from hyaline to deep golden brown. SEM shows them to be typically pliable and unornamented, with a distinct neck. In contrast to most mature envelopes of *Trachelomonas* which are brittle and crack upon air drying, those of *Strombomonas* simply collapse. SEM-EDS analyses indicate Mn and Fe as major mineralizing elements in envelopes of all 6 organisms. TEM reveals their ultrastructural morphology to be similar, with only slight differences in density and thickness. In all species, Mn is present as needle-like microcrystallites enmeshed in an amorphous matrix. The taxonomic significance of these data will be considered.

(27)

Immune Function in
Lymphoma-bearing Mice

J. C. Travis and L. Shipway
University of North Carolina at Charlotte

Immune function was evaluated in C57BL/6 mice bearing a lymphoma. Specifically, the plaque-forming cell (PFC) and antibody-dependent cellular cytotoxicity (ADCC) assays were used to monitor patterns of immunosuppression in several cellular compartments. The number of spleen PFCs was significantly reduced following tumor transplant compared to controls. In addition, the ability of splenocytes to mediate ADCC was depressed in tumorous animals. However, resident peritoneal cells and peritoneal exudate cells from tumorous animals were similar to controls as ADCC effectors.

(28)

Delta 9-tetrahydrocannabinol:
Effects on Macromolecular Synthesis,
Growth, and Metabolism in
Tetrahymena pyriformis

Robert E. Daniel, Sally J. Billingsley,
and D. O. Abbott

Murray State University and Montana Department of
Health & Environmental Sciences

Randomly dividing cultures of *Tetrahymena pyriformis* GL were challenged with delta-9-tetrahydrocannabinol and the effects on the growth curve, met-

abolic activity and macromolecular synthesis noted. Drug challenge produced a dose-dependent exaggeration of the lag phase and an increased generation time during log phase growth. The synthetic rates of DNA, RNA, and protein were also markedly depressed, while overall metabolic activity was only moderately affected.

(29)

In vitro Response of Marine Teleost Fibroblasts to Benzo(a)pyrene and to 4-Nitroquinoline-1-oxide

Janet J. Kelly

College of Charleston

Comparative investigations of cellular responses to chemical carcinogens represent an important aspect of efforts to determine the significance of lower vertebrates in cancer research. To this end we have initiated a series of experiments to evaluate the responses of two permanent lines of fibroblasts derived from marine fish and several early passage cultures derived from several species of estuarine fish to the carcinogen benzo(a)pyrene and 4-nitroquinoline-1-oxide. At least one permanent line revealed alterations in growth pattern not previously observed in untreated cultures and which are at least superficially typical of *in vitro* transformed mammalian cells. Regions of altered growth characteristics developed as macroscopic foci easily detectable 11 days after initial exposures. Studies are anticipated to phenotypically compare these aberrant cells with transformed mammalian cells and methods for quantifying this response for possible application as a short term assay for environmental carcinogens are being evaluated.

(30)

Comparative Effects of Cytochrome P450 Induction on the Activation of Benzo(a)pyrene and 2 Aminoanthracene in the Rat and the Toadfish (*Opsanus tau*)

D. M. Milling, F. X. Sargeant,
and M. B. Maddock

College of Charleston

The relative proportions of catalytically-distinct forms of cytochrome P450 enzymes which populate the endoplasmic reticulum of mammalian cells appear to be a major determinant of the extent to which potentially-mutagenic chemicals (promutagens) are activated or are detoxified. The characterization of functionally-different cytochrome P450 populations in fish tissues and their possible alteration by environmental contaminants are necessary considerations when fish assays are used to detect potential genotoxic hazards in aquatic ecosystems. Comparative studies are in progress to determine the effects of hepatic microsomal enzyme (S-9) preparations from rats and toadfish (*Opsanus tau*) pretreated with standard enzyme inducers (3 methylcholanthrene, phenobarbital and Aroclor) on the metabolism of two promutagens (benzo(a)pyrene and 2 aminoanthracene) to *Salmonella* mutagens.

(31)

Changes in Gamma-glutamyl Transpeptidase Activity during 2-Acetylaminofluorene Induced Hepatocarcinogenesis in Rats

Eli R. Capouya and Ronald Lindahl

University of Alabama

Enzymes are becoming increasingly important as markers for tumor cell progression. Certain enzyme phenotypes appear to be tumor-specific whereas others may show marked changes in activity not only in the presence of tumor, but also in response to tumor promoting actions and agents such as partial hepatectomy or phenobarbital exposure. We have been investigating changes in the activity of Gamma-Glutamyl Transpeptidase (GGT) activity during 2-acetylaminofluorene induced hepatocarcinogenesis in rats. The results indicate that GGT is not tumor-specific. In hepatomas, the activity of GGT is approximately 100 times that in normal liver. However, in rats fed only phenobarbital, a known promoter of 2-AAF-induced hepatocarcinogenesis, GGT activity often equaled or exceeded the GGT activity of rats fed 2-AAF alone or 2-AAF followed by phenobarbital prior to overt tumor formation. Consequently, GGT activity alone is not an adequate marker for 2-AAF-induced hepatocarcinogenesis.

(32)

Isolation and Characterization of Bacteriophage Specialized Transducing Phages Carrying the *ilvC* Gene of *Escherichia coli* K-12

Norman Baylor and Arthur L. Williams

University of Kentucky

In *Escherichia coli* K-12, the normal attachment site for bacteriophage lambda is minute 17; however, upon rare integration events, lambda can integrate into the *ilv* region located at minute 83. The gene cluster at minute 83 contains three control units, one of which is the *ilvC* operon that is induced by its substrates. The *IlvC*⁺ lysogen of an *ilvC*⁻ strain gave rise, after heat induction of the lysogen, to transducing particles carrying the wild type allele of the *ilvC*⁻ marker. In addition, the *IlvC*⁺ lysogen gave rise to transducing particles which carried the wild type allele of the *cya*⁻ marker. Moreover, from this observation one may imply that the clockwise excision of the *ilv* cluster extended from *ilvC* through *cya*. Preliminary experiments indicate further that *rep* and *rho* genes are also carried by the λ *dilvC* phages. Enzyme levels in strains carrying the λ *dilvC* phages were similar to those expected for *E. coli* K-12 derivatives implying that the control site of the *ilvC* gene was not altered by the insertion of lambda into *ilv* gene cluster. Additional experimentation with λ *dilvC* phages should provide an insight into determining and characterizing the DNA material situated to the right of the *ilvC* gene.

(33)

Use of Bacteriophage Lambda to Isolate Transducing Phages Harboring *ilv* Genes of *Escherichia coli* K-12

Mark Ensor and Arthur L. Williams

University of Kentucky

A collection of *ilv*-transducing lambda phages has been prepared from *E. coli* K-12 lysogens with lambda inserted into the *ilv* cluster. The ability of lysates to transduce *ilv*⁻ mutants to *ilv*⁺ was determined. Lysogens carrying λ *dilvA*, λ *dilvAD*, λ *dilvADE*, and λ *dilvADE-rbs* were isolated. To confirm that intact regulatory regions were present, the isoleucine-valine biosynthetic enzyme activities were measured. In each case, the transduced marker was repressed by growing in the presence of excess branched-chain amino acids. DNA from the λ *dilvA*, and λ *dilvAD* transducing phages has been extracted and purified by standard procedures. Restriction endonuclease digestion of DNA isolated from specialized transducing phages, λ *dilvA* and λ *dilvAD*, with *Eco*RI and *Hind*III was performed. DNA fragments were then examined by agarose gel electrophoresis. Preliminary results indicated gel patterns that were different from patterns obtained with control lambda DNA. The utility of these λ *dilv* phages to genetically order markers to the *rbs* side of *ilv* will be also discussed.

(34)

Characterization of Antithyroid Substances (ATS) Produced by *Escherichia coli*

Arthur L. Williams

University of Kentucky

Cultures of *Escherichia coli* produce a substance that inhibits the thyroid. This antithyroid(s) (ATS) has been partially purified 60–100 fold by fractionation of cell-free filtrates with ultrafiltration, Sephadex G-200, DEAE-cellulose chromatography and ammonium sulfate. The ATS preparations were routinely fractionated into three distinct protein fractions whether supernatants were used from dextrose-peptone or synthetic medium. The results from the chromatographic analysis indicated that fraction II carried the bulk of ATS activity. Thyroid-Stimulating Hormone (TSH)-like activity was also found in the active fraction of ATS preparations. In addition, ATS is heat-resistant, sensitive to trypsin and pronase digestions and apparently requires an intact protein complex for activity. Based upon the immunological studies, it was found that ATS induced antibodies and the titer of antibodies was 320 as determined by the Complement-Fixation test. Furthermore, immunodiffusion plates indicated that only fraction II carried the antigenic activity as revealed by the antigen-antibody interactions.

(35)

Mouse Protection Test for Group B Streptococcus, Type III (*Streptococcus agalactiae*)

Diane O. Fleming

Wright State University

A mucin model for *Streptococcus agalactiae* (SS620), Lancefield Group B Type III (GBS) which was developed in this laboratory was used to study the passive transfer of immunity to the experimental infection in mice. Hyperimmune rabbit antisera was produced using Lancefield formalin killed bacteria. Protection to an LD₅₀ was obtained with the homologous Type III antisera. No protection was afforded with the heterologous Type Ia antisera. The protective effect of the Type III antisera could be specifically removed by absorption of the sera with aliquots of the Type III GBS. Antisera to the Group B antigen provided partial protection to an LD₅₀ challenge but was not effective against an LD₉₀. This model will be used to develop a standardized test to assay protective levels of antibodies in humans following vaccine administration. Initial tests are being done with sera from human volunteers who received the native (EDTA extracted) antigen of Baker and Kasper (Houston, Texas). Since the mouse protection test may also allow for the selection of potential candidates for the vaccine by screening serum samples from the population at risk, sera from adult females is also being tested for protective antibody levels in the mucin murine model.

(36)

Correlation of Biochemical and Pathological Characters in the Micrococcaceae

A. D. Anderson, J. Lewis, and G. Vredevelde

University of Tennessee at Chattanooga and Erlanger Hospital

Ninety blood plate isolates from urine of both male and female patients were obtained. They were inoculated onto API 20E strips. The characters found were computer analyzed to determine any significant correlation with clinical findings as reported on patient charts.

(37)

Inhibition of Selected Corn Fungal Pathogens by *Pseudomonas* Isolates from *Tripsacum dactyloides* Caryopses

J. L. Haug, R. C. Anderson, and A. E. Liberta

Illinois State University

A bacterium (*Pseudomonas* sp.) repeatedly isolated from caryopses of eastern gamma grass (*Tripsacum dactyloides*), inhibited the growth of selected species of fungi, including *Penicillium chrysogenum*, *Rhizopus stolonifera*, and *Trichoderma viride*. This inhibition may prevent fungal decomposition of *T. dactyloides* caryopses. Fungal pathogens of maize causing seed rots and seedling blights were tested against the bacterium. Inhibition of growth was noted in the cases

of *Diplodia maydis*, *Macrophomina phaseoli*, *Helminthosporium carbonum*, and *Fusarium roseum*. The bacterium was then established on surface-sterilized kernels of maize and shown to retain inhibitory properties after periods of storage. Applying the bacterium to kernels may impart to corn a resistance against fungal pathogens causing seed rots and seedling blights.

(38)

Growth and Nitrogen-fixation Characteristics of a Thermophilic Blue-green Alga

Julie L. Corkran and Conrad E. Wickstrom
Emory University

Blue-green algal mat samples dominated by *Mastigocladus laminosus* Cohn were taken from Hot River (Yellowstone National Park), a stream seasonally providing an isothermal habitat at 50 C. Enrichment cultures of the mat in a nitrogen-free medium showed that this heterocystous blue-green alga (cyanobacterium) grew over a 25 C range (30 to 55 C); temperatures >55 C were lethal. Generation times for a *M. laminosus* 40 C isolate were determined at 40 and 50 C at low (7800 lux) and high (16,000 lux) light intensities in gyrotory water baths. Doubling times were shorter at the 50 C displacement temperature (10 hr) than at the 40 C isolation temperature (14 hr); light intensities were not limiting. The temperature-dependent nitrogenase activity of a 50 C isolate was determined by the acetylene-reduction technique. Maximum ethylene evolution occurred at 40 and 50 C. Nitrogenase activity was not detected at 55 or 60 C; activity at 30 C was 21% of the maximum.

(39)

Studies on Growth Characteristics of the Crude Oil Utilizing Colorless Alga, *Prototheca zopfii* (Kruger) (Chlorococcales)

David Koenig and Bailey Ward
University of Mississippi

The colorless alga, *Prototheca zopfii*, has been shown by other investigators to utilize certain crude oil fractions as a source of organic carbon. For the reported studies, the alga apparently was not grown under conditions which would establish the influences of environmental growth variables upon crude oil utilization. We have established culture conditions which yield high rates of growth for *Prototheca zopfii* in non-petroleum, organic enrichment media. These parameters of culture afford references to which crude oil enriched growth can be compared. Our assay involves a gas chromatography system which allows for determination of quantity and quality of crude oil fractions utilized by *Prototheca zopfii* grown under controlled variables of culture environment. We shall describe growth characteristics of the alga as well as results of the crude oil utilization studies.

(40)

A Systematic Overview of the Woodwardioid Ferns (Blechnaceae)

Raymond Cranfill
University of Michigan

For some time, the woodwardioid ferns have constituted a confused, poorly understood assemblage of ferns in the Blechnaceae. Although comprising no more than fifteen species and distributed almost entirely within the northern hemisphere, they have been largely neglected by pteridologists. Considerable disagreement over the disposition of taxa within the group, both on the specific and generic levels, has existed since the work of Presl. Recent attempts to divide the group into four or more genera seem inappropriate, especially upon analysis of the problematical Mexican species, *Woodwardia martinezii* Maxon. This paper presents a new classification on the generic and subgeneric levels, based on morphological, cytological and paleobotanical evidence.

(41)

Flavonoids of Representative Species of the Marsileaceae

Joseph H. Sullivan and James W. Wallace
Western Carolina University

The three genera of the Marsileaceae represent a unique group of leptosporangiate ferns whose evolutionary history remains obscure. Their flavonoid profiles are similar to those of the other primitive leptosporangiate ferns which have been studied; these include species representing the Schizaeaceae, Stromatopteridaceae, Gleicheniaceae, Plagiogyriaceae, Loxsomaceae and Hymenophyllaceae. In addition to containing the typical leptosporangiate fern flavonoids, flavonol-3-O-glycosides (e.g. quercetin and kaempferol-3-O-galactosides, glucosides, rhamnoglycosides and arabinosides) *Marsilea* also accumulates di-C-glycosylflavones. Noteworthy is the observation that species of *Marsilea* also accumulate the rarely encountered C-glycosyl-xanthenes, mangiferin and isomangiferin. The phylogenetic significance of these polyphenolic profiles will be discussed.

(42)

A Re-examination of *Lepidostrobos*

Sheila D. Brack-Hanes and Barry A. Thomas
*Eckerd College and Goldsmith's College,
University of London*

Lepidostrobos is a genus that was established by Brongniart in 1828 for Paleozoic lycopod cones. Since that time, the genus has been used for a variety of cones that have similar anatomical features. New information concerning spores from the type specimen is consistent with data from bisporangiate and monosporangiate *Lepidostrobos* species. There is now compelling evidence that the genus represents a heterogeneous group and should be divided.

(43)

A Survey of Gametangial Position and Protective Structure in the Simple Thalloid Liverworts (Metzgeriales)

Karen S. Renzaglia

East Tennessee State University

The Metzgeriales exhibit a wide range of variation in gametangial position and type of associated protective structure. Gametangia of 28 metzgerialian genera from 11 families were here observed with the light and scanning electron microscopes. Archegonia range from scattered and solitary as in *Fossombronia* and *Apotreubia* to aggregated in distinct groups located either on the main thallus (Pallaviciniaceae, Pelliaceae, Allisoniaceae, Makinoaceae) or on very specialized lateral or ventral branches (Hymenophytaceae, Metzgeriaceae, Aneuraceae). Female protective structures range from absent to filamentous bracts to elaborate involucre flaps. Similarly, antheridia vary from solitary, naked and scattered (*Fossombronia*) to solitary and completely sunken in gametophytic cavities (Pelliaceae, Makinoaceae) to variously aggregated along the dorsal midline (Pallaviciniaceae, Phyllothallicaceae, Treubiaceae, Allisoniaceae) or restricted to reduced short shoots (Metzgeriaceae, Hymenophytaceae, Aneuraceae). Such information is utilized in speculating on relationships among the various genera as well as in postulating probable lines of phylogenetic progression in the group.

(44)

A Preliminary Report on the Bryophytes of the Proposed Basin for the Richard B. Russell Lake

Caroline C. Douglass, John E. Fahey, III,
and Walter C. Credle

Clemson University

Russell Lake will impound a thirty-mile stretch of the Savannah River in the Piedmont of Georgia and South Carolina. To date, over 100 species of bryophytes have been collected in the lake basin. Some of the area's distinct habitats and commonly associated bryophytes are as follows: Floodplain forests—*Forsstroemia trichomitria*, *Anomodon attenuatus*, *Leucodon julaceus*, *Leucolejeunea clypeata*, *Leskea gracilescens*, *Anacamptodon splachnoides*, *Pallavicinia lyellii*; Mesic hardwood slopes—*Anomodon rostratus*, *Hypnum imponens*, *Ctenidium molluscum*, *Bryoandersonia illecebra*, *Eurhynchium strigosum*, *Dicranum scoparium*, *Leucobryum albidum*; Xeric upland forests—*Dicranum condensatum*, *Thelia asprella*, *Frullania tamarisci* subsp. *asagrayana*, *Hedwigia ciliata*; Small rocky streambeds and banks—*Conocephalum conicum*, *Fissidens viridulus*, *Diphyscium foliosum*, *Thuidium delicatulum*, *Jubula pennsylvanica*, *Anthoceros* sp.; River banks—*Scapania undulata*, *Climacium americanum*, *Cephalozia connivens*, *Hypnum lindbergii* var. *americanum*, *Philonotis mühlenbergii*, *Leskea obscura*, *Minum hornum*; Cultivated fields—*Physcomitrium pyriforme*, *Acaulon muticum* var. *rufescens*, *Pleuridium acuminatum*, *Riccia* sp.; Beaver ponds—*Leptodictyum siphon*, *Ricciocarpos natans*, *Haplodadium microphyllum*, *Micromitrium austinii*, *Aphanorhagma serratum*.

(45)

Identification of *Sphagnum* Taxa (Peat Mosses) in the Field (in Wisconsin) Using Macroscopic Characters

Frank D. Bowers

University of Wisconsin—Stevens Point

Several characters can be utilized in the identification of *Sphagnum* taxa in their native habitats. First, recognition of obvious habitats or niches is required such as in a bog or fen, in shade or open, on top or side of hummock, in wet depression or immersed, etc. Morphological characters of *Sphagnum* which aid in identification are tumidity, number and arrangement of branches, size and color of plant, size of terminal bud, features of stem leaves, and branch leaf shape and arrangement. These morphological characters can be seen with the aid of a 10× or 15× handlens. Macrophotographs will be used to illustrate the characters noted. It must be realized that all *Sphagnum* taxa cannot always be identified in the field but in most instances a great majority can be.

(46)

A Double Stress Hypothesis for Heavy Metal Toxicity in Mineral Deficient Cultures of Moss and Fern Gametophytes

Raymond L. Petersen

Howard University

There are three possible toxicity responses for combinations of chemicals: (1) additive—the summation of the toxicity response of two or more substances when they occur separately is equal to their toxicity response when they occur in combination; (2) antagonistic—the combination response is less than the projected additive response; and (3) synergistic—the combination response exceeds the projected additive response.

There have been a number of reports on the ameliorating (antagonistic) effects of the ferrous ion on heavy metal ion toxicity. These researchers have demonstrated that heavy metal ions (Cd^{++} and Hg^{++}) are more toxic in the absence of Fe^{++} than in its presence. It was therefore proposed that Fe^{++} has an antagonistic effect on heavy metal ion toxicity. In this report evidence based on percent spore germination and gametophyte growth rate of *Onoclea sensibilis* and *Polytrichum commune* is presented, demonstrating that the Fe^{++} -deficient heavy metal ion containing cultures represent a double stress system. This means the reported antagonistic effect of Fe^{++} is unsubstantiated.

(47)

The Effects of Heavy Metals on the Growth of the Lichen Phycobiont *Trebouxia erici* (Chlorococcaceae)

A. Chris Odehede, Raymond L. Petersen,
and Lafayette Frederick

Howard University

The toxic effects of heavy metals such as cadmium, mercury, and lead on the growth of the lichen phy-

cobiont *Trebouxia erici* in liquid medium has been investigated. Five growth rate parameters have been used in the study. They were as follows: turbidity or percent transmittance, cell count, dry weight, chlorophyll content, and DNA synthesis (colorimetric, Dische).

Increasing concentrations of cadmium caused significant decreases in the population of cells and this in turn affected the dry weight and decreased both the absorption spectrum of chlorophyll, and DNA. These effects were observed in 7-, 15-, and 21-day-old cultures. In 15- and 21-day-old cultures where mercury was added instead of cadmium, similar effects were observed. The effect of lead under similar cultural conditions was less pronounced. In terms of decreased chlorophyll production and decreased synthesis the relative toxicity of the heavy metals used is $Hg > Cd > Pb$.

The results obtained will be discussed in terms of which of the growth rate parameters could best predict the physiological well-being of the organism and at what level each of the heavy metals is toxic to the organism.

(48)

The Gomphonemataceae
(Bacillariophyceae) of Kentucky

Keith E. Camburn

Kentucky Nature Preserves Commission

The diatom flora of Kentucky is rich in representatives of the Gomphonemataceae which is attributable to the widely varied physiographic regions within the state. Aquatic surveys conducted by the Kentucky Nature Preserves Commission revealed that species of *Gomphonema* and *Gomphonopsis*, the two genera of this family which occur in Kentucky, were often major constituents of the flora. To date 35 taxa have been observed of which several appear to be previously undescribed. Numerous taxonomic problems were encountered due to both the exceptional plasticity of these taxa and the largely uninvestigated diatom flora of Kentucky. In order to observe the variability exhibited by these taxa an attempt was made to collect the full range of aquatic habitats in the state. In Kentucky the Gomphonemataceae, which is represented by taxa of both eurytopic and restricted distributions, occur in associations of taxa which appear to be primarily correlated with physiography and water quality.

(49)

More about "Rare" Freshwater Algae

L. A. Whitford

North Carolina State University

Further evidence is offered that many rarely collected species of freshwater algae are widespread in the United States and often in the Northern Hemisphere. They are stenoeccious in habitat requirements and only rarely are found in abundance. Examples in several classes of algae are given.

(50)

A Mouse Model to Detect Allergens from
Chlorella (Chlorophyceae) Isolated from
Common Housedust

Frank L. Ralston, Patricia L. Walne,
and Carl J. Wust

University of Tennessee

Algae have been implicated as one type of sensitizing agent in some human allergies to housedust. To test for the presence of allergens that could be isolated from algal cultures, we developed a mouse model in which animals would be sensitized with whole cell suspensions or homogenates of *Chlorella*. Possible component allergens were assessed by the degree of response in active cutaneous anaphylaxis. The mice (one Swiss outbred and two inbred strains) were immunized intraperitoneally using aluminum hydroxide as adjuvant. At 5-day intervals after immunization, each mouse received an intravenous injection of a solution containing Evans Blue dye; this was followed by intradermal injections of several concentrations of algal preparations into predetermined locations. After 1-1½ hr the animals were killed, the skin removed, the area of dye diffusion measured with a micrometer. All three strains of mice gave positive responses (dye spot >5 mm) with homogenates, indicating the usefulness of the model for characterization of putative allergens.

(51)

Cytology of the Ascus of the Ascomycete
Fungus *Neocosmospora vasinfecta*

H. R. Mainwaring, M. D. Moody,
and J. T. Joyce

Western Carolina University

Cultures of *Neocosmospora vasinfecta* were grown on either corn meal or Sabouraud dextrose yeast agar at 25°C. 5-8 day old perithecia were fixed in a freshly mixed fixative of absolute ethanol-propionic acid-10% chromic acid (3:1:1 v/v) and were hydrolyzed and stained using a modified version of Raju and Newmeyer's propionic-iron-haematoxylin procedure in which perithecia were mordanted in iron alum prior to staining. For comparison some perithecia were fixed in Carnoy's fluid and hydrolyzed in RNase prior to treatment in mordant and staining in propiono-carmin. Nuclear events in the ascus follow the typical ascomycete pattern. Karyogamy is succeeded by two meiotic and one mitotic division before the spores are delimited. A second mitosis occurs to render all eight ascospores binucleate. Spindle pole bodies (SPBs) and intranuclear spindles are present. Polar caps are sometimes visible during early prophase of the first meiotic division.

(52)

The Biology of *Entomophthora*
(Fungi, Zygomycetes)

Frederick T. Wolf

Vanderbilt University

Based on a survey of the literature concerning the genus *Entomophthora*, the discussion will include a

consideration of morphology, life cycles and the characters employed in species delimitation. Methods for the growth in axenic culture of some species will be described, while others have resisted repeated efforts at cultivation. Details of the infection process, pathology of the fungus in the insect host, and environmental control of spore production will be presented. Factors predisposing to the development of natural epizootics will be considered, as well as methods for the large scale production of reproductive bodies in attempts at artificial control of insect populations, and the results of field trials. The prevalence, symptomatology and treatment of a human disease called rhinophycomycosis due to *E. coronata* (*Conidiobolus coronatus*) will be discussed.

(53)

Control of the Endophyte, *Epichloe typhina*, in *Festuca arundinacea*

Dan R. Varney,¹ Malcolm Siegel,²
Robert Buckner,² and Richard Chapman²
*Eastern Kentucky University¹ and
University of Kentucky²*

While endophytic fungi have long been known to reside in graminaceous plants, *Epichloe* has only recently been positively linked to the fescue toxicity syndrome in cattle grazing on certain fields of tall fescue (*Festuca arundinacea*). Partially successful attempts have been made to remove the ascomycetous fungus from infested Clones and seeds by various chemical means. In vivo tests for the past three years indicate possible control of *Epichloe* in infested tall fescue plants. New tests have been initiated to measure chemical eradication of the endophyte from fescue seeds.

(54)

The Taxonomic Status of *Physarum bogoriense*

Harold W. Keller and Kenneth D. Whitney
*Wright State University and
University of North Carolina—Chapel Hill*

Physarum bogoriense was described in 1898 by Raciborski from collections made at Buitenzorg, Java. Until recently monographers such as the Listers, Hagemstein, Macbride, and Martin accurately circumscribed this species. In 1969 Martin and Alexopoulos broadened the circumscription of this species in their world monograph *The Myxomycetes*, and included specimens from California with clustered spores and reticulate plasmodiocarps. Raciborski's holotype, original description, and illustrations were examined and should be tied to the following description and the name *Physarum bogoriense*: sporangia globose, sessile, or forming unbranched plasmodiocarps; peridium dehiscing in stellate fashion into reflexed lobes; capillitium physaroid, lime knots rounded, smooth, connected by hyaline, limeless threads; pseudocolumella absent; spores minutely verrucose and free. The California specimens are plasmodiocarpous, often branching or forming an irregular network; peridium cartilaginous and thickened, sometimes fracturing but not dehiscing in any definite pattern; capillitium badhamoid, consisting of branching lime-filled tubules or occasional angular lime knots; pseudocolumella pres-

ent and sometimes massive; spores distinctly spinulose and loosely clustered in varying numbers. These taxa differ in habit, peridium, capillitium, and spores. Two strikingly distinct species are represented here, not a single variable species linked by intermediate specimens.

(55)

Taxonomically Important Diagnostic Characters in the Genus *Laccaria*

Gregory M. Mueller
University of Tennessee

Laccaria is a cosmopolitan genus of ecologically and potentially economically important mushrooms. In addition to forming ectomycorrhizal associations with numerous tree species, several taxa appear to influence forest succession by acting as pioneer species. *Laccaria*, therefore, may prove to have practical applications. The taxonomy of the group, however, is very unstable and a large discrepancy in the number of taxa within the genus exists. One major problem in delimiting stable and more natural taxonomic concepts within the genus is the paucity of good diagnostic characters. Critical examination of the available delimiting characters should increase our understanding of the taxonomy and give insight into the biology of this phenotypically plastic genus. To augment the more classical diagnostic morphological and anatomical characters, character states derived from various β -taxonomic techniques will also be analyzed. These include examination of culture mat characteristics and electrophoretic enzyme analysis. Additionally, if successful in domesticating *Laccaria*, analysis of the variation in culturally induced sporocarps and genetic compatibility studies will be attempted.

(56)

Vertebral Aging of Scalloped Hammerhead, *Sphyrna lewini*, and Seven Other Sharks from North Carolina by Silver Nitrate and Crystal Violet Staining Methods

Frank J. Schwartz and Randy K. Avent
*Institute of Marine Sciences
University of North Carolina*

Eight species of sharks (blacknose, *Carcharhinus acronotus*; blacktip, *C. limbatus*; dusky, *C. obscurus*; sandbar, *C. plumbeus*; silky, *C. falciformis*; spinner, *C. brevipinna*; Atlantic sharpnose, *Rhizoprionodon terraenovae*; and scalloped hammerhead, *Sphyrna lewini*) were aged using silver nitrate (Stevens 1975) and crystal violet (Johnson 1979) staining techniques. Silver nitrate proved most accurate and reliable. Crystal violet often produced overstained annuli causing reduced age reliability. Visible annuli were evident within 1–3 min. staining with silver nitrate while crystal violet required 10–15 min. Aging fresh and dried *Sphyrna lewini* vertebrae (20♂, 560–1530 mm fork length; 15♀, 722–1108 mm FL) indicated a linear fork length to vertebral radius relationship of $y = 174.9 + 175.9x$ ($r = 0.966$ males) and $y = 124.6 + 199.7x$ ($r = 0.915$ females). Annuli were formed in July when least radial increment was noted; radial increments were largest in May and November. Ages of eight years

(males) and five years (females) were ascertained. Caution was necessary in interpreting the first annulus. All known shark aging techniques are compared and discussed.

(57)

Mummification in the Sandbar Shark
Carcharhinus milberti (Muller and Henle)

E. Rosa-Molinar,¹ C. S. Williams,¹
and S. Collard²

¹Tuskegee Institute¹ and University of West Florida²

During the 1980 Annual Pensacola Shark Rodeo, a gravid 212 cm female sandbar shark *Carcharhinus milberti* was collected. Examination revealed a gonadosomatic index of 0.2733; the right functional ovary contained white eggs up to 12 mm in diameter; the liver was 7% body weight. A total of nine embryos, all male, located in both uteri, were in a state of atrophy. The atrophied specimens and 2 normal *C. milberti* embryos were fixed in formalin, washed, skinned, eviscerated and clear stained with alcian blue in acetic acid-alcohol for 24–48 hours. Soft x-ray data were also collected for the abnormal specimens and for the normal specimens. Comparisons of the cranium and vertebral column between normal and the mummified embryos revealed several differences, especially in the palatoquadrate cartilage, Meckel's cartilage, basihyal, hyomandibular, and pharyngobranchials and epibranchials.

(58)

Potential for a Shark Fishery in the
Northern Gulf of Mexico

Steven Branstetter
Dauphin Island Sea Lab

A two year study of the potential of longline fishing in the northern Gulf of Mexico resulted in an overwhelming dominance of shark catches. The data indicated that fishing for sharks on a commercial basis might well be a profitable venture along the northern Gulf coastal region. Large scale shark fisheries have often resulted in an overexploitation of available stocks. For this reason a large industry is not suggested for the northern Gulf, but small independent operations could possibly prove successful as either a primary or secondary source of income for local fishermen. Several outlets are available for the sale of the various shark products. Recommendations are made as to preferable types of gear and bait. An outline of the initial cost outlays and time frame estimates for turning a profit is presented.

(59)

Seasonal Occurrence of Multiple
Caudal Spines in the Atlantic Stingray,
Dasyatis sabina (Pisces: Dasyatidae)

Christopher M. Teaf and Thomas C. Lewis
Florida State University

Multiple caudal spines often have been observed in the family Dasyatidae. Though this phenomenon has been investigated in a peripheral way several times, seasonal duplication or replacement has generally been rejected as a likely explanation. In this study

main number of primary caudal stings in the Atlantic stingray, *Dasyatis sabina* (Pisces: Dasyatidae), evidenced an increase from one to two over a period of 23 days in June–July 1977, and had returned to a mean of one by October 1977. The timing and prevalence of this synchronous seasonal spine replacement in *D. sabina* represent documentation of an anecdotal phenomenon and suggest that a similar pattern may exist in other genera of stinging rays.

(60)

Correlations Among Serum Testosterone,
Estrogens, GSI and Gonadal Stages in
King Mackerel, *Scomberomorus cavalla*
(Pisces), and Other Scombrids from
the Northeast Gulf of Mexico

Robert MacGregor, III and John Finucane
University of Alabama in Birmingham and
National Marine Fisheries Service, Panama City

Testosterone and estrogens were assayed by radioimmunoassay from serum of both sexes of king mackerel in 1980. Among male kings, testosterone (48.27 ng/ml) was highest in developing and ripe fish compared to spent fish (15.0 ng/ml). Although there was a significant increase in gonadosomatic index (GSI) in developing males, there were no differences in testosterone levels among these developing stages. In female king mackerel, when categorized by oocyte staging (I–II, developing; IV, ripe; V, spent) changes in serum testosterone and GSI were significantly correlated. Serum estrogens demonstrated this trend but adjacent groups were not significantly different, except between stages III and V. Testosterone was the only parameter to discriminate immature (stage I) and spent (stage V) females. Changes in serum testosterone and estrogen in other Scombrids and billfish also appeared to correlate with gonadal development. The results indicate that in these female marine teleosts changes in testosterone levels may be a useful tool in identifying and timing maturation and spawning.

(61)

A Seven Month Study of the
Ichthyoplankton Population
(September–March) in the
Upper Mobile Bay

Carole Crampton
University of South Alabama

An ongoing study of the ichthyoplankton population during the months September 1980 to March 1981 was conducted in the Upper Mobile Bay. Five stations were sampled. Stations 1 and 5 were located at the mouths of the Blakeley and Mobile Rivers which empty into the Bay. The other three stations were located in the middle of the upper bay, in areas not directly affected by a particular drainage. Replicate five minute tows, using a 1/2 meter diameter 505 µm plankton net, were made near the surface. In addition, dissolved oxygen, salinity, temperature, and pH were taken. Larvae were sorted and identified in the laboratory. Abundance and diversity of the ichthyoplankton is compared in relation to the physical parameters. Results from the fall samples indicate low diversity, and

dominance by euryhaline marine species. No statistical differences between stations are evident from these collections.

(62)

Semilunar Spawning Cycle of the Gulf Killfish *Fundulus grandis* (Pisces) from an Alabama Salt Marsh

Mark S. Greeley and Robert MacGregor, III

University of Alabama in Birmingham

A portion of the reproductive cycle was intensively studied during May and June of 1980. Fish were collected at daily to weekly intervals from a channel at the Point aux Pins marsh station, Mobile County, Alabama. The data collected, especially the female gonadal-somatic indices (GSI), egg diameters, and spawning readiness measurements, conclusively demonstrate the occurrence of a semilunar spawning rhythm in these killfish. Spawning peaks were strongly correlated with the bimonthly high tides associated with the new and full moons. This finding will be discussed as it relates to other environmental parameters measured during this study and to other pertinent aspects of the reproductive cycle. Finally, our observations concerning *Fundulus grandis* reproduction will be compared with more casual observations in the literature as well as to related studies by various workers, including ourselves, on other *Fundulus* species.

(63)

New Records and Range Expansions of Exotic Fishes in Florida

Walter R. Courtenay, Jr.,¹ Jeffrey N. Taylor,¹ and James A. McCann²

Florida Atlantic University¹ and
U.S. Fish and Wildlife Service²

In 1979, an established population of the yellowbelly cichlid (*Cichlasoma salvini*) was found in a rockpit south of Fort Lauderdale. This is the first record for this exotic fish in North America. The firemouth (*C. meeki*) is also established in the same pit, representing the first record for this species in Broward County. The blackchin tilapia (*Tilapia melanotheron*), previously known to be established along a portion of eastern Tampa Bay, is slowly expanding its range southward, and a second population has been found in the Banana and Indian rivers, south of Cape Canaveral. New localities for the Jack Dempsey (*Cichlasoma octofasciatum*) and the southern platyfish (*Xiphophorus maculatus*), as well as range expansions for the spotted tilapia (*Tilapia mariae*) and other exotic fishes in Florida, are recorded.

(64)

Distributional Notes on the Fishes of West Central Kentucky with Comments on Rare Species

Melvin L. Warren, Jr.

Kentucky Nature Preserves Commission

Fish collections made under the auspices of the Kentucky Nature Preserves Commission in the Shawnee Hills Section of Kentucky have resulted in several

major findings. Of particular import was the rediscovery of populations of *Etheostoma histrio* and *Percina onychitae* in the Green River drainage. Neither has been collected from the system in 90 years. Recent efforts indicated that both species persist from the mouth of the Barren River downstream to and including the Mud River. Apparent relic populations of *Elasmosoma zonatum*, previously known only from extreme southwestern Kentucky, were discovered in both the Green and Tradewater river basins. The first records of *Lepisosteus oculatus*, *Etheostoma asprigene*, and several other species were made in the poorly collected Tradewater River basin. Habitat notes and conservation status of these species in Kentucky will be discussed. Additional findings are anticipated in the west central Kentucky region.

(65)

Effects of Channelization and Clearing on the Fishes in the Obion and Forked Deer Drainage Systems of Western Tennessee

Gray J. Carmichael

Memphis State University

Fishes in the Obion and Forked Deer drainages were sampled in the summer of 1979 by seining, rotenoning, and electrofishing. A total of 79 species of fishes were collected. Thirty of these species were absent in channelized and cleared sections, but were present in adjacent backwaters or in unchannelized regions. The Tennessee Heritage Program lists 15 of the 30 species with affected distributions as uncommon or rare. An additional 6 species appear to be of special concern in the drainages: *Notropis lutrensis*, *N. venustus*, *Lepomis symmetricus*, *Etheostoma* sp., *Noturus nocturnus*, and *Umbra limi*. *Etheostoma* sp., the red snub-nose darter, present in the Obion and Forked Deer, is listed as of special concern in Tennessee. Unchannelized sites produced 4.7 times the weight, per unit effort, of sport and commercially important species than did the channelized sites. Channelization and clearing apparently lowers diversity, reduces abundance, and affects distribution in these river systems.

(66)

Fishes of the Waccamaw System

John R. Shute, Peggy W. Shute,
and David G. Lindquist

University of North Carolina at Wilmington

The Waccamaw River originates from Lake Waccamaw, NC and flows south approximately 225 km to its confluence with the Pee Dee River at Winyah Bay near Georgetown, SC. The river drains a total area of 3885 km² of low-lying coastal swampland. From 1976 to present 670 collections have been made within the Waccamaw system. A total of 13,075 specimens have been cataloged representing 56 species from 19 families. Species of special concern are *Fundulus waccamensis*, *Menidia extensa*, and *Etheostoma perlongum* (all endemic to Lake Waccamaw), plus undescribed species of *Noturus* and *Elasmosoma* found within the system. Special consideration will be given in regard to the distribution of the two undescribed forms. Squamation of 191 specimens of *Etheostoma olmstedii* examined from the Waccamaw River is compared with

that of *E. olmstedii maculaticeps* of the lower Pee Dee and neighboring Cape Fear drainages. Differences are noted.

(67)

Fishes of the Western Lignite Region in Alabama

Patrick E. O'Neil and Maurice F. Mettee

Geological Survey of Alabama

Eight stream sites in Choctaw, Marengo, and Sumter Counties were sampled every 6 weeks from November 1979 through August 1980. Data were analyzed by using the DARTER (Data Analysis and Retrieval of Environmental Resources) system developed by the Geological Survey of Alabama. A total of 58 fish species and 2 hybrids, representing 19,239 specimens and weighing 21,353.2 g, were collected. Numerically dominant species included: *Notropis baileyi* (rough shiner) 35.5 percent; *Notropis bellus* (pretty shiner) 18.9 percent; *Notropis* sp. (undescribed shiner) 14.3 percent; and *Pimephales notatus* (bluntnose minnow) 5.2 percent. Dominant species by weight included: *Notropis baileyi*, 24.7 percent; *Notropis bellus*, 10.5 percent; *Notropis chrysocephalus* (Striped shiner), 8.2 percent; *Notropis* sp., 6.1 percent; and *Lepomis megalotis* (longear sunfish), 4.8 percent. Species displaying unique patterns of distribution and abundance were *Elassoma zonatum*, *Etheostoma parvipinne*, *Hybognathus nuchalis*, *Hypentelium etowanum*, and *Lampetra aepyptera*.

(68)

Temporal Analysis of the Fish Community Structure in Bayou St. John, Lake Pontchartrain, Louisiana

B. Thompson, S. Levine, and L. Deegan

Louisiana State University

Bayou St. John is an urban impacted tributary on the south shore of Lake Pontchartrain, Louisiana. Currently it is a low salinity, tidal influenced arm of the lake. Samples were collected by seine, gill net, and bottom larvae net at approximately 30 day intervals for a two year period. The area consists of two major habitats, dense grass beds and open sand-silt flats. The grass beds are nurseries to such resident species as *Syngnathus scovelli*, *Micropterus salmoides*, and *Lepomis* spp. and migratory species like *Cynoscion nebulosus*. Young-of-the-year of *Anchoa mitchilli*, *Brevoortia patronus*, *Membras martinica*, *Menidia beryllina*, *Leiostomus xanthurus*, and *Micropogonias undulatus* show a preference for the open flats. Multivariate techniques were employed to distinguish community components and seasonal patterns of usage.

(69)

Egg Production of a Repeat Spawning Freshwater Fish

Joy B. Shrode

University of Georgia

Egg production for a spawning season is little known in repeat spawning fishes, although daily fecundity has been measured. *Cyprinodon n. nevadensis* spawns re-

peatedly over a long breeding season. Egg production of breeding pairs of *Cyprinodon n. nevadensis* maintained in the laboratory for 14 months was studied. Number and size of eggs produced was determined daily. Egg production was correlated with female size/age.

(70)

Characteristics of Wild Brown Trout (*Salmo trutta*) Redds

Thomas F. DeChant and Jerry L. West

Western Carolina University

Managers of trout fisheries are aware of the importance of substrate conditions in the maintenance of wild trout populations. Research has shown detrimental effects when spawning sites are exposed to calamities such as silt and harsh weather conditions. Because of the lack of information on the ability of southern Appalachian trout streams to produce young of the year fish, this study was designed to characterize wild brown trout spawning sites (redds). We measured the physical characteristics of redd sites; intra-gravel dissolved oxygen, permeability, temperature, and apparent velocity during the incubation period; and success of redds in producing fry. Wild brown trout were observed spawning in two relatively undisturbed streams in Pisgah National Forest of western North Carolina. Twenty-two redds were located in predominately pool-riffle transitional areas. Mean water depth was 16 cm, surface velocity 34 cm/sec, length 94 cm, width 47 cm, depth 11 cm, and substrate diameter 0.25 mm to 7.5 mm. Mean intragravel dissolved oxygen was 11.0 mg/l, permeability 1367 cm/hr, and apparent velocity 19.25 cm/hr. When compared to laboratory studies of the developmental requirements of salmonids, these intragravel characteristics are adequate for a high survival rate. Mortality, however, was high and may have been due to a variety of factors which included high discharges, extreme cold and accompanying anchor ice, and predation; factors not measurable during the study.

(71)

A Comparison of Brook Trout (*Salvelinus fontinalis*) Embryo Survival and Emergence in a Heavily Silted and Relatively Unsilted Stream

Steve Grindstaff and Jerry L. West

Western Carolina University

The survival of brook trout embryos planted in Wayhutta Creek and Mull Creek, both in Jackson County, North Carolina, were compared. Wayhutta Creek is modified extensively by human activity and is heavily silted, while Mull Creek is modified much less by man and is relatively unsilted. Brook trout embryos were planted in Vibert-Whitlock boxes at several sites in both streams and the intragravel characteristics (permeability, apparent velocity, dissolved oxygen and temperature) were monitored weekly by use of groundwater standpipes. The embryos remained in the streams for six weeks (from Jan. 26, 1980 to March 13, 1980) at which time hatching was completed. Half of the sites were dug up and the number of dead embryos were counted to determine the

percent of embryo survival. The remaining embryos were left in the gravel to later determine the percent of emergence. The intragravel characteristics in both streams were found to be above the minimum levels required for development when compared to laboratory studies. The percent of embryos that hatched in the unsilted stream varied from 81.0% to 93.2% whereas in the silted stream, it varied from 24.2% to 69.8%. In the unsilted stream 7.2–14.8% of the embryos emerged while only 0.4% emerged in the silted stream. This study indicates that even though intragravel temperature, dissolved oxygen, permeability and apparent velocity are adequate for embryo survival, silt tends to trap embryos causing their death and preventing emergence.

(72)

Age and Growth of the Black Bullhead,
Ictalurus melas (Rafinesque), from an
Oxbow Pond in Southern West Virginia
(Pisces: Ictaluridae)

Joan Schramm and Donald Tarter
Marshall University

An age and growth study of Black Bullheads was done from an oxbow pond of the Twelvepole Creek drainage basin in Wayne County, West Virginia. Age by vertebrae was consistent to age by pectoral spine cross sections. Age results were compared to length frequencies. Back calculations were determined from annular measurements from spine cross sections measured on a vernier scale by a traveling microscope. Results of growth were compared to other studies of this species.

(73)

The Life-cycle of
Prochristianella hispida (Linton, 1890)
(Cestoda: Tetrarhynchidea)

Tom E. Mattis
Tusculum College

Prochristianella hispida possesses a three-host life-cycle containing a copepod, a callanassid or penaeid shrimp, and a dasyatid stingray. Following four days incubation in seawater, the cestode's non-operculate, bifilamented egg contained an infective hexacanth that lacked the ciliated layer characteristic of a coracidium. When the egg was eaten by a copepod, the oncosphere escaped from the eggshell, penetrated through the intestine into the hemocoel, and metamorphosed into an encysted, bothridiate metacystode that possessed rudimentary tentacles and hooks. Although not confirmed experimentally, this stage is apparently infective for the second intermediate host. An examination of specimens of *Callanassa islagrandi* produced a series of developing stages, including the fully-developed tentaculate metacystode which is infective for the definitive host. The adult cestode develops in stingrays that feed on infected callanassid or penaeid shrimps.

(74)

Comparison of Annual Prevalence of
Two Species of *Myxobolus* (Protozoa:
Myxosporidia) and a Trematode
Metacercaria (*Uvelifer ambloplitis*)
in the Striped Shiner,
Notropis chrysocephalus

Cynthia C. Thye and W. L. Current
Auburn University

The annual prevalence of two gill-parasitizing myxosporidians and encysted metacercariae of *Uvelifer ambloplitis* (Trematoda: Diplostomatidae) were examined in the Striped Shiner, *Notropis chrysocephalus*. Plasmodia of the two species of *Myxobolus* were distinguished by their location on the gills and by the type of spore they contained. The distribution of both myxosporidian species for the 12 month study appeared over-dispersed ($\bar{x} < s$). The population distribution of both species of *Myxobolus* could be described best by negative binomial distributions. Fish were most heavily infected by the two myxosporidians from November through April when water temperatures were relatively low, 11 to 15°C. Both myxosporidian populations decreased when water temperature increased to 21°C and remained low from June through October. Mean numbers of plasmodia were significantly higher on the right when right and left gill bars were compared. Most of the myxosporidian plasmodia were concentrated in smaller fishes while metacercariae of *U. ambloplitis* were more abundant in larger fishes. Reproductive strategies of the three parasites will be discussed.

(75)

Ultrastructure of *Chloromyxum trijugum*
(Myxozoa: Myxosporaea) in the Redear
Sunfish (*Lepomis microlophus*) and
Bluegill (*Lepomis macrochirus*)

O. J. Booker and W. L. Current
Auburn University

Scanning electron microscopy revealed that vegetative stages (plasmodia) were attached to the gall bladder mucosal surface. Transmission electron microscopy of the species-to-species interface revealed that plasmodia possessed membrane-bound pseudopodium-like structures which touched or occasionally enveloped ends of mucosal cells. Topography of the luminal surfaces of plasmodia consisted of small, short ridges which project into the bladder lumen. Cell-to-cell interactions within plasmodia representing various aspects of spore production, or sporogenesis, will be discussed.

(76)

Helminth Parasites of Largemouth Bass
(*Micropterus salmoides*) from
Radnor Lake, Tennessee

Jon H. Lowrance
Middle Tennessee State University

The seasonal occurrence, distribution and abundance of the cestodes, *Proteocephalus ambloplitis* and

Bothriocephalus claviceps, and the acanthocephalan, *Neoechinorhynchus cylindricus* infecting the large-mouth bass, *Micropterus salmoides*, from Radnor Lake, Davidson County, were studied from November 1978 through December 1979. The cestode and acanthocephalan populations exhibited pronounced seasonal cycles. Mature worms from both groups occurred during the fall and winter seasons, while immature worms occurred during the spring and summer seasons. The cestode, *P. ambloplitis* occurred year round, while the cestode, *B. claviceps*, and the acanthocephalan, *N. cylindricus* were totally lost from the host during the late spring and summer. These parasites were in close association and the seasonal cycle of each worm followed the same basic pattern.

(77)

Population Ecology of *Octospiniferoides chandleri* (Acanthocephala)

David J. DeMont and C. Frederic Bryan
North Carolina State University and
Louisiana State University

Patterns of spatial distribution and population dynamics of *O. chandleri* in mosquitofish (*Gambusia affinis*) were studied in a Louisiana farm pond. *O. chandleri* was distributed among mosquitofish hosts according to the negative binomial distribution. Large fish and females were more heavily infected than small fish and males. Site preference in the mosquitofish alimentary tract varied with worm size (age) and sex. Seasonal changes in *O. chandleri* density resembled patterns reported previously for other acanthocephalans with recruitment peaks in fall and winter. But, when adjustments were made to compensate for the effect of temperature upon duration of earliest juvenile stages, major recruitment was shown to take place in spring and summer. The correspondence of seasonal peaks in recruitment and mortality rates, age distribution in the parasite population, and parasite-host interrelationships all suggested density dependent regulation of the *O. chandleri* population in its mosquitofish host.

(78)

Tetrapetalonema llewellyni (Nematoda: Filarioidea) from Raccoons of Cades Cove, Great Smoky Mountains National Park

Alan Rabinowitz and Vicki Major
University of Tennessee

From October 1979 to August 1980, blood was collected from 141 raccoons (*Procyon lotor*) trapped in the Cades Cove area of the Great Smoky Mountains National Park. The blood was examined by the modified Knott's technique. Unsheathed microfilariae identified as *Tetrapetalonema llewellyni* were found in 109 of the raccoon samples. One raccoon also had circulating microfilariae of *Dipetalonema procyonis*. Because killing of the animals was prohibited, no adult worms were recovered.

(79)

Ticks from Raccoons of Cades Cove, Great Smoky Mountains National Park

Vicki Major and Alan Rabinowitz
University of Tennessee

From November 1979 to August 1980, 334 ticks were collected from 68 raccoons in the Cades Cove area of the Great Smoky Mountains National Park. Only two genera of ticks were present. One hundred and eighty-five of the ticks were identified as *Dermacentor variabilis*, the other 129 were identified as *Ixodes*, either *I. texanus* or *I. cookei*. Seasonal activity of the three species is now being analyzed.

(80)

Self-fertilization in the White-lipped Land Snail *Triodopsis albolabris*

Gary F. McCracken
University of Tennessee

The breeding system of the polygyrid land snail *Triodopsis albolabris* was studied in laboratory colonies through the use of allozyme-genetic markers. Isolated virgin individuals self-fertilized only after several months of apparent self-sterility. Isolated pairs appeared to reproduce solely by outcrossing. Overall, the normalized reproductive success of paired individuals was about 86 times greater than that of isolates. Nine natural populations of this snail were surveyed at eight allozyme loci. All populations were highly polymorphic, and heterozygosity was high and agreed with Hardy-Weinberg expectations. This indicates that selfing is not common in established populations. I conclude that *T. albolabris* avoid inbreeding by selfing if at all possible. However, if the probability of finding a mate is low (assessed by several months without finding one), lone individuals self-fertilize.

(81)

Dispersal Patterns and the Potential for Gene Flow Among Populations of *Tetraopes tetraophthalmus* (Insecta)

David E. McCauley and James Ott
Vanderbilt University and
North Carolina State University

Milkweed beetles, *Tetraopes tetraophthalmus*, feed almost exclusively on the common milkweed *Asclepias syriaca*. Larvae feed on the roots; adults feed on the leaves and flowers of the host plant. Given that the beetles can complete their entire life cycle within a milkweed patch and that patches may persist for many years, it has hypothesized that beetles inhabiting a particular milkweed patch represent a local population or deme. The degree that these demes can become differentiated genetically is dependent, in part, on the rate at which they exchange migrants. Mark-recapture studies of adult *Tetraopes* found in Giles County, Virginia show that movement within milkweed patches is limited, movement between patches is rare, and that males move more than females. Data on the distribution of dispersal distances is tested against a variety of statistical models incorporating both randomly and non-randomly distributed flight distances.

(82)

Comparative Caloric Values of Arthropods in Young and Older Ecosystems

Joe E. Winstead

Western Kentucky University

Arthropods collected from an ecologically young system in central Tennessee collectively showed average energy values of 5464 cal/g dry wt. compared to an average of 5126 cal/g dry wt. for samples collected in a nearby wooded ravine and older system over a seven year period (1974–1980). Caloric differences on a community basis were significant at the 0.01 level. Average caloric differences per year ranged from 130 to 602 cal/g dry wt. with the younger system always showing the higher values. Energy comparisons of arthropods may show a measure of system productivity.

(83)

Effects of Larval Crowding on Life History Parameters in *Drosophila melanogaster*

Catherine A. Teare, Joseph F. Scheiring,
and D. Gale Davis

The University of Alabama

We report here the effects of competition for space in *Drosophila melanogaster* on survival, time of eclosion, and size of adults. Increase in crowding as a function of space (as opposed to food) was found to delay emergence of flies, to expand the emergence period, to decrease survival to emergence, to reduce the weight of emerging flies, and to cause the total biomass produced per growth tube to approach a relatively constant value at high levels of crowding. A separation of space and food effects in crowding studies is suggested.

(84)

Foundress Associations in *Polistes exclamans* (Hymenoptera: Vespidae)

Alan MacCormack

University of North Carolina, Chapel Hill

Foundress associations in polistine wasps have been shown to contribute to the fitness of the dominant wasp at a direct cost to the joining females, possibly compensated by kin selection. 108 *Polistes exclamans* colonies were observed from April through September 1980. Two or more females were observed together on 22 of the pre-emergence nests. These colonies did not have significantly more cells at the time of first adult emergence. This does not support a kin selection explanation. In 11 of the 22 colonies, the wasp originally marked on a nest was displaced by a later arrival. Displacement was also observed, without cohabitation, among the 86 colonies classed as singly founded. In *Polistes exclamans*, females that do not attempt or are not successful in founding their own nest apparently often directly benefit by joining.

(85)

Assortative Mating in the Soldier Beetle, *Chauliognathus pennsylvanicus*

Michelle Grenier, Luther Brown,
and David McCauley

George Mason University and Vanderbilt University

Past studies have suggested that directional sexual selection operates in soldier beetle populations and that a positive correlation exists between the sizes of mating males and females. We investigated the generality of these conclusions by re-examining the question of sexual selection with respect to body size in soldier beetle populations in Tennessee and Virginia. Collections were made during the autumn of 1980. A significant ($P = .05$) correlation was found between the elytra lengths of males and females captured in copula. Mean elytra lengths for mated and unmated males and mated and unmated females were not significantly different. Similar patterns were found when dry weights were examined. While geographical variability may explain discrepancies among past studies, temporal variability in the mating patterns of this species may also be important.

(86)

Functional Significance of Horn Size in the Forked Fungus Beetle, *Bolitotherus cornutus* (Coleoptera: Tenebrionidae)

Luther Brown and Blair Siegfried

George Mason University and
Lock Haven State College

Male forked fungus beetles possess a pair of horns that arise from the pronotum and may extend well over their heads. Males are highly variable in horn size, the horns of particular individuals constituting as much as 57 and as little as 5 percent of elytra length. Females do not possess horns and small horned males may closely resemble females. Horns appear to function as weapons during aggressive encounters between males, but the individual effects of horn and body size have not previously been examined. The significance of horn size to mating success was examined by pairing males so that the members of each pair had equivalent elytra lengths but different horn sizes. The larger horned member of each pair courted females significantly more often ($P = .05$) than did the smaller member, yet the smaller horned member courted with equal vigor after the larger horned individual was removed. These observations suggest that horn size, and not body size, is an important determinant of male access to mates in this species.

(87)

The Guild Concept in Spider Ecology

Barbara J. Abraham

Eastern Kentucky University

A "guild" is a group of species that exploit the same class of environmental resources in a similar way. Grouping the large number of spider species in a community into guilds has facilitated analysis of community structure and function, but lack of uniformity of constructed spider guilds indicates problems with ap-

plying the concept to spiders. Actual prey are unknown for most spiders, so resource class is inferred from predatory technique. However, different prey may be captured by the same predatory technique, and the same prey by different techniques. Furthermore, predatory technique is not independent of microhabitat, which may also directly affect available prey. Basing spider guilds solely on predatory technique decreases their usefulness in explaining resource partitioning and predicting composition of spider communities. Examples of the problem from the literature and a field study in northern Utah are given, and a solution is proposed.

(88)

Sanitary Behavior by the Social Spider
Mallos gregalis Simon (Araneae,
Dictynidae): Distribution of
Excreta as Related to Web
Density and Animal Movements

W. J. Tietjen
Georgia College

Mallos gregalis is a group-living species of spider in which thousands of individuals of both sexes and various age classes occupy a semi-permanent web. To avoid fouling of such a long-term web site, one might expect sanitary behavior in such species. Animal movements and the distribution of silk as related to the distribution of excreta were recorded with the aid of a microcomputer-controlled television camera. Data suggested that *M. gregalis* do not deposit excreta randomly over the web-surface, but preferentially deposit wastes at sites outside their most frequent areas of habitation. Qualitative evidence for other types of sanitary behavior are presented. The utility of the computer-camera apparatus in other fields of behavioral research is also discussed.

(89)

The Effect of Clearcutting on
Populations of *Plethodon jordani* and
P. glutinosus (Plethodontidae)

Andrew N. Ash
East Carolina University

During winter 1979, approximately 11 hectares of oak-hickory forest at an elevation of 975 meters on Rich Mountain, near Highlands, North Carolina, was clearcut. Population densities of *Plethodon jordani* and *P. glutinosus* were monitored for two summers after deforestation on the clearcut, and in a nearby forested control area. Populations of *P. jordani*, the more numerous species, decreased significantly on the clearcut in the first summer, and became non-existent in the second summer. Populations of *P. glutinosus* on the clearcut were probably unaffected in the first summer, but were non-existent in the second summer. Control densities of both species seemed stable during this time. Possible causes of population decline, and the relationship of this work to other, similar studies will be discussed.

(90)

Comparison of Avifaunal Populations in a
Swamp and Bottomland Deciduous Forest
Habitat in Southwestern Louisiana

Don W. Gowan
University of Southwestern Louisiana

There were no observed differences in bird species diversity nor its components of evenness and species richness in a comparison of an open swamp and a bottomland forest habitat near Lake Martin, St. Martin Parish, Louisiana. Bird species diversity was more closely correlated with species richness than evenness of both habitats. This high correlation between species richness and diversity supported the idea that niche availability (structural variability) appeared to be a mechanism regulating diversity. There were seasonal differences in similarity values with the highest similarity measured during the summer when many bird species (especially permanent residents) nested in one habitat but fed in a different habitat. During the winter, lowered similarity between habitats was observed due to the appearance of large flocks of winter residents (especially fringillids) which showed strong habitat preferences.

(91)

The Influence of Vegetation Structure
on Resource Partitioning and Diversity
in Desert Bird Communities

Kathleen C. Parker
University of Wisconsin

Previous investigations have found that in certain western desert areas a measure of the physiognomy diversity of the vegetation is a good predictor of the bird species diversity of the associated avian community. While this study revealed a relationship between physiognomic diversity and bird species diversity in nine study areas located throughout the desert Southwest, findings suggest that in structurally complex vegetation, one or more life forms or even species may be supplying the majority of the nesting or foraging substrates. The occurrence of other life forms increases the physiognomic diversity, but many life forms are used infrequently by the majority of the bird community. Summary indices insofar as they fail to reflect the life form spectrum of a given community seem to be inadequate indicators of available utilizable substrates and, therefore, bird species diversity.

(92)

Estimating Population Size in
Winter Blackbird Roosts

E. Duke Whedbee and Andrew N. Ash
East Carolina University

Past methods of estimating the population size of winter blackbird roosts, such as estimating the rate of flow of the incoming flocks or extrapolation from data concerning the daily rate of accumulation of droppings, have tended to be unreliable or time consuming. An alternative method incorporating data on the densities and types of roost vegetation and behavioral studies of the spacing characteristics and densities of

the various species involved, leads to estimates with a higher degree of reliability and accuracy.

(93)

Songs of the Northern Parula Warbler (*Parula americana*)

Richard D. Brown, Deborah B. Hahn,
and Gregory C. Cornwell

University of North Carolina at Charlotte

Songs from over 100 individual Northern Parula Warblers were studied from 11 states and 2 Canadian provinces. Parula Warblers sang two main song types: advertising or normal songs and defense or playback songs. Playbacks elicited defense songs which were initially shorter and softer than normal songs and were often run together. Both song types consisted of several phrase types each sung several times in succession and rising in pitch toward the end of the song. These phrases contained abruptly slurred elements giving the song a buzzy quality characteristic of the species. Songs often terminated with a single non-buzzy note given at a lower pitch. Songs of different individuals varied in syntactical, temporal, frequency and morphological features. Songs of the endangered Bachman's Warbler (*Vermivora bachmanii*) are compared with Parula Warbler songs.

(94)

Microhabitat Partitioning by Small Mammals in Cedar Glade and Deciduous Forest Habitats

Steven W. Seagle

University of Tennessee and
Oak Ridge National Laboratory

Discriminant function analysis was used to characterize microhabitats for small mammal species inhabiting east Tennessee cedar glade and deciduous forest habitats. *Peromyscus leucopus* and *Ochrotomys nuttalli* occupied significantly different microhabitats in the cedar glade. *Blarina brevicauda* and *P. leucopus* used significantly different microhabitats in the deciduous forest. Male and female *Peromyscus* also occupied different microhabitats in the deciduous forest. It is proposed that interspecific competition with *Ochrotomys* limits *Peromyscus* to a more specific microhabitat within the cedar glade and thus prevents microhabitat segregation by the *Peromyscus* sexes. Deciduous forest female *Peromyscus* appear to occupy more favorable microhabitats which may contribute to increased reproductive output by the species. This intraspecific microhabitat partitioning may thus increase the resource exploitative ability of *Peromyscus* and partially explain the low diversity of small rodents in southeastern deciduous forests.

(95)

Microhabitat Selection and Competition by Small Mammals in a Pine Forest

J. Thomas Kitchings and Steven W. Seagle

Oak Ridge National Laboratory and
University of Tennessee

Three species of small mammals (*Peromyscus leucopus*, *Ochrotomys nuttalli* and *Blarina brevicauda*)

were live-trapped in a pine forest on the Oak Ridge National Environmental Research Park. Differential microhabitat utilization by the three species was characterized by discriminant function analysis. Significantly different patterns of utilization were demonstrated and it was inferred that interspecific competition was important in structuring the small mammal assemblage. A community matrix of competition coefficients was calculated by multiple regression of habitat variables and species capture frequencies. The result of this analysis and subsequent experimental removal of *Peromyscus leucopus* from the trapping area indicated that this species was the competitive dominant in this assemblage. Sponsored by the Office of Health and Environmental Research, U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation.

(96)

Intraspecific Variation in the Red-backed Vole (*Clethrionomys gapperi*) from the Southern Appalachian Mountains

George D. Baumgardner

Memphis State University

The effect of pooling specimens from neighboring collection sites into a larger sample locality was investigated by examining intraspecific variation in 143 red-backed voles from the southern Appalachian Mountains. Animals were taken from nine sites within a 25 square mile area. Patterns of variation for 27 skeletal characters were examined using univariate and multivariate statistical techniques. The first three vectors of a principal components analysis accounted for 67.7% of the measured variation; seven vectors accounted for 98%. Results indicated little size difference between individuals at different sites, and patterns of morphologic variation showed no relationships with spatial or altitudinal variation; therefore, combining neighboring sites would not produce confounding results.

(99)

Rates of Reproduction and Recruitment in Grizzly/Brown Bear (*Ursus arctos*) Populations as a Function of Adult Male Abundance

Stephen F. Stringham

University of Tennessee

Adult male grizzly/brown bears sometimes kill cubs. Yet, contrary to expectations, interpopulation comparisons and those between years within the Yellowstone National Park Population, show little indication that recruitment rates were significantly lower where or when adult males were most abundant. But interpopulation comparisons do reveal an inverse relationship between reproductive indices versus abundance of adult males; and within YNP, during years that the grizzlies aggregated at garbage dumps to feed, rates of recruitment (ages 0.5 → 1.5 → 2.5 → 3.5 & 4.5 years) and perhaps of reproduction, did seem critically affected by adult male abundance during the years of a cohort's conception and birth—suggesting that the young were affected indirectly via the mother, and maybe directly after birth. Although these relation-

ships are very strong, we lack the quantitative data on food supply and other key variables to be sure that adult male abundance really controlled rates of reproduction and recruitment under those conditions, much less how important/dominant it would be under other conditions.

(100)

A Comparative Study of Succession as it Proceeds in Four Artificially-constructed Farm Ponds in Cabell County, West Virginia

Kim Benson and Donald Tarter

Marshall University

A comparative study of succession as it proceeds in four artificially-constructed farm ponds in Cabell County, West Virginia began in November 1979. Three of the study ponds were constructed by the West Virginia Soil Conservation Service, the other by the resident farmer. Ages of the ponds were three years, twenty years, twenty-five years and eighty to one-hundred years. Parameters studied include measurement of pond water area and depth, dissolved oxygen, carbon dioxide, temperature, pH, conductivity, turbidity, iron, phosphate, low-range alkalinity and hardness. Atomic absorption spectrophotometric analysis of the calcium content was conducted in the laboratory. Study of biotic factors include some aquatic insects, larval and adult stages, and analysis of phytoplankton and zooplankton. Analysis of pond vegetation consisted of four line transects of approximately six meters each with three circular plots of one meter square along each transect.

(101)

Nitrogen Fixation During Development of a Thermal Algal-bacterial Mat Community

Glenda C. Wickstrom and Conrad E. Wickstrom

Emory University

The timing of nitrogen fixation during succession of a thermal mat community was studied in an artificial stream in Yellowstone National Park. Community biomass, composition, and water quality were followed over a fifty-day period. Following clearing, the algal component of the mat increased 10-fold from week one to week seven. Nitrogen-fixing blue-green algae (cyanobacteria) were initial colonizers of the stream. Areal nitrogen fixation remained relatively constant over time; however, nitrogenase activity/ μg Chl *a* decreased as the mat matured. High temperature mat ($>50^\circ\text{C}$) fixed less nitrogen than low temperature mat. Source water remained relatively stable with respect to concentrations of NO_3^- , NO_2^- , and NH_3 . Before mat establishment, concentrations of these nutrients were constant along the stream. The amount of NO_3^- in water over the developing mat decreased temporally and with distance from the source, indicating utilization by the mat community; NH_3 and NO_2^- concentrations did not simulate this pattern.

(102)

Effects of Chironomids on Phosphorus Release from Sediments of Lake Harris, Tuscaloosa County, Alabama

Gary L. Halcomb and Joseph F. Scheiring

University of Alabama

The release of phosphorus from lake sediments is a process that has been primarily studied from the physical and chemical point of view. This study will report on the effects of biotic factors upon phosphate release from lake sediments. Chironomid larvae are raised in small aquatic ecosystems (plastic tubes) and the phosphorus content of the overlying water is measured periodically for one month. Control tubes sans chironomids are used to measure the phosphorus content of water minus biotic factors. It is found that chironomids increase the rate of phosphorus release from lake sediments. The implications upon primary productivity and phosphorus budget modelling are discussed.

(103)

Phosphorus Uptake by a River Swamp System

William L. Tietjen and Jack C. Carter

Georgia Southwestern College

Analysis of total phosphorus flow through a swamp system along Muckalee Creek, below Americus, Georgia, was done as a part of an OWRT-financed study. Twenty eight percent of the phosphorus entering the system was from sources above the city, twenty five percent was contributed by the city sewage treatment plants and the remaining phosphorus came from non-defined sources within the city. Eighty percent of the phosphorus entering the swamp left the swamp by way of Muckalee Creek. Mean annual accumulation was estimated to be 5.7 g P/m^2 . Analysis of standing crop suggests an annual phosphorus uptake of 0.1 g P/m^2 by the overstory vegetation. Most of the accumulated phosphorus was probably retained by the swamp sediments. Analysis of the upper 15 cm of sediments indicates twice as much phosphorus in the study swamp as in a control site upstream from the city.

(104)

Effects of Strip-mine Drainage on Leaf-litter Processing in a Small Woodland Stream

James W. Littrell and Joseph F. Scheiring

University of Alabama

Alder leaf packs were placed in three riffle areas of Yellow Creek, Tuscaloosa County, Alabama to assess the impact of strip-mine drainage on detritus processing in a small woodland stream in Alabama. One riffle was above the strip-mined area and was not affected by strip-mine drainage. The other two riffles received varying amounts of runoff from the mine. It was observed that strip-mine drainage slows down processing rates probably due to the lack of shredders in the impacted riffles. The implications of these results to lotic ecosystems will be discussed.

(105)

Evaluation of Community Information Indices

H. N. Polovino,¹ M. P. Farrell,¹
C. H. Pennington,² and R. H. Strand
*Oak Ridge National Laboratory¹
Waterways Experiment Station²*

Researchers characterizing and comparing ecological communities are often faced with the problem of collapsing large species lists into a single numerical expression of community structure. Historically, quantitative species diversity indices have been used to assess spatial and temporal changes in ecological communities. However, other classification estimates, e.g., binary similarity coefficients, correlation coefficients, and Euclidean distances, offer alternative methodologies for delineating community composition that may be more robust to sampling error. This study presents fifty algorithms developed using the Statistical Analysis System for calculating indices of community structure. Using fisheries data collected from the Mississippi River, multivariate statistical analysis (i.e., cluster analysis, principal components, and stepwise discriminate functions) were utilized to determine which indices or groups of indices described reflected changes in community composition. For the Mississippi River fisheries, no single index or family of indices was capable of statistically separating ecological communities and/or events. Furthermore, simple binary similarity measures appear to be an attractive alternative for testing a wide range of complex environmental hypotheses. *Supported in part by the Office of Health and Environmental Research and Office of Environmental Compliance and Overview, U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation and U.S. Army Corps of Engineers, Waterways Experiment Station under the Environmental Water Quality Operational Studies, Project VIIB, Waterways Field Studies.*

(106)

Quantitation of the Role of the Solar Ultraviolet Radiation on Aquatic Ecosystems

John Calkins
University of Kentucky

Sunlight is regarded as a generally benevolent agent; however, it is becoming increasingly evident that the short wavelength ultraviolet components of the solar spectrum are highly injurious to most living organisms. Successful species obviously can cope with the solar UV exposure they receive. Traits which reduce sensitivity to solar UV frequently serve other obvious functions, obscuring the role they play in UV photobiology. Solar injury can be reduced by: 1) Avoidance, 2) Shielding, 3) Repair after injury. Laboratory and field measurements were combined to quantitate both typical solar exposure and the UV resistance of a variety of organisms; it has been found that among the organisms examined solar UV tolerance and exposure are remarkably similar. The near equality of UV tolerance and exposure is a matter of current environmental importance since manmade technologies may deplete the stratospheric ozone layer and thus increase

the biologically significant solar ultraviolet radiation at the earth's surface.

(107)

Response of Nonfouling Organisms to Organotin Antifouling Paints

Dee Dundee, Roy Giardina,
and Gary Swindler
University of New Orleans

The mechanism of organotin antifouling coatings functions via the slow release of the organotin toxicants from the surface of the paint. The release of these toxicants is effective in preventing the attachment of barnacles and algae to the painted surface. These toxicants are also being introduced to nonfouling organisms. Toxicities have been found for various species of fish, molluscs and crustaceans. Research indicates that the estuarine substrates may act as a sink for these toxic organotin compounds.

(108)

A Taxonomic and Statistical Analysis of Diatom Community Structure in a Calcareous Mississippi Stream

Ruth O'Quinn
Mississippi State University

Epiphytic and epilithic diatoms were collected monthly over a one-year period from shaded and unshaded (sunny) sites in a shallow, calcareous Mississippi stream. Individual diatom taxa were identified using light and scanning electron microscopy, and the resulting floristic list represents the first of its kind from Mississippi's freshwater habitats. Approximately 100 taxa have been identified with *Navicula minima* Grun. and *Nitzschia dissipata* (Kütz.) Grun. being the dominant taxa. Other important taxa were *Navicula menisculus* var. *upsaliensis* (Grun.) Grun., *Navicula cryptocephala* var. *veneta* (Kütz.) Rabh., *Cymbella turgida* (Greg.) Cl. and *Achnanthes minutissima* Kütz. The spatial and temporal changes in the community were described by a species diversity estimate (H') and the number of taxa per sample (S), and the effects of substrate type and light intensity on community structure were compared by a similarity index (SIMI). Observed differences in structure between epiphytic and epilithic and between shaded and sunny sites were correlated with physical factors.

(109)

Some Aspects of the Periphytic Diatom (Bacillariophyta) Community in Cypress Bayou Reservoir, Louisiana

Robert G. Kalinsky
Louisiana State University in Shreveport

A limnological investigation of Cypress Bayou Reservoir was conducted between 1977 and 1980. The periphytic diatom community in two sections of the reservoir was studied. Samples were collected bi-weekly from a station in the shallow end of the reservoir and another station at the reservoir spillway. Over 130 different diatom taxa were recorded during the study period with the genus *Eimotia* being represented by seventeen taxa. Two community composi-

tion parameters, Shannon's information measure (H') and Simpson's similarity index (SI), were calculated for each sample collected. The H' values ranged from 0.6901 to 2.4049 while the SI values ranged from 0.2045 to 0.9510. The periphytic diatom community in both locations exhibited similar diversity values but showed low similarity values.

(110)

**Macrobenthos of Ross Barnett
Reservoir, Mississippi**

Charles M. Cooper and Luther A. Knight, Jr.
*USDA Sedimentation Lab. and
University of Mississippi*

The benthic macrofauna of Ross Barnett Reservoir, Mississippi (121 km²) were studied during 1979 as part of a fish food preference study. Though the reservoir was shallow (15 m max. depth), had a stable shoreline and thermal structure, the number of species collected was limited (14 species). Although smaller in number, species identified were representative of lentic habitats in Mississippi with major contributors being *Hexagenia bilineata*, *Chaoborus punctipennis*, *Chironomus attenuatus*, *Tanypus stellatus*, and *Coelatanypus tricolor*. Comparisons showed Ross Barnett Reservoir supported about half of the benthic species present in 4 large North Mississippi flood control reservoirs. It was, however, only slightly less productive than the reservoirs, which, though less stable, contained older and more productive sediments. As Ross Barnett Reservoir ages and bottom sediments become more enriched, both the number of species and productivity should increase. *Supported in part by D-J Federal Aid Projects F-48-1 and F-48-2 made available by the Mississippi Department of Wildlife Conservation.*

(111)

**Population Dynamics and Community
Structure of Littoral Zooplankton in
Lake Itasca, MN**

Bill Doolittle
University of Tennessee

The population dynamics of inshore zooplankton in Lake Itasca, MN have been studied during the summers of 1978 to 1980. Community structure and population trends have been evaluated in terms of regulating influences, with particular regard to a midsummer population decline. The effect of an inshore migration by young-of-the-year perch fry on the zooplankton was also investigated.

(112)

**Structural and Functional Measurements
Utilized to Assess the Impact of
Coal Ash Effluent upon
Aufwuchs Communities**

**Richard B. Nicholson, Donald S. Cherry,
James R. Clark, and John Cairns, Jr.**
*Virginia Polytechnic Institute and
State University*

The influence of fly ash upon periphyton communities colonizing glass microscope slides was studied

in a mountain stream (Adair Run) receiving fly ash effluent and in an artificial stream system dosed with specific levels of total suspended solids (TSS in ppm). Selected structural and functional parameters analyzed included dry weight, ash free dry weight, chlorophyll *a*, ATP, carbon fixation, and sulfate assimilation. TSS levels ranged from 10–50 ppm in Adair Run and 8–100 ppm in artificial streams. All experimental parameters were consistently higher at the ash influenced station of Adair Run than measured in the upstream reference station. Productivity appeared to be enhanced by the warmer temperatures ($\Delta T = 4.5^\circ\text{C}$) and greater sulfate concentrations ($\geq 200 \text{ mg/l}$) from the fly ash effluents. At low TSS (8.0–40 ppm) in the artificial streams, all parameters except chlorophyll *a* and ATP were greater in dosed streams. At higher concentrations (80–100 TSS), all values except AFDW were greater in reference streams. Potential mechanisms of inhibition or enrichment of Aufwuchs communities exposed to fly ash relative to sedimentation, turbidity, nutrients, toxic elements, and pH fluctuations are discussed.

(113)

**Physical and Chemical
Characteristics of Streams in the
Great Smoky Mountains National Park**

David G. Silsbee and Gary L. Larson
National Park Service

Water samples were collected from streams in Great Smoky Mountains National Park and analyzed for pH, conductivity, alkalinity, hardness, turbidity, nitrate, and temperature. A small number of samples were also analyzed for Ca, Mg, Na, K, and Si. Water quality was related to bedrock geology, elevation, and successional status of the watersheds. The mineral composition of the bedrock and its resistance to weathering affected pH, conductivity, alkalinity, hardness, and Ca, Mg, K, Na, and Si concentrations. The cool, wet climate of the high elevations resulted in greater streamflow, lower pH and lower concentrations of some geologically derived elements than at low elevations. Nitrate concentrations were found to be higher in the high elevations than low, and also higher in undisturbed areas than those which had been logged or farmed prior to the establishment of the park (1936).

(114)

**A Study of the Interrelationship of
Acid Precipitation, Stream System
Dynamics, and pH Depression Toxicology**

Raymond C. Mathews, Jr. and Gary L. Larson
Great Smoky Mountains National Park

Physical and chemical features of wet atmospheric deposition are being monitored at five locations in the Great Smoky Mountains National Park. The average pH of wetfall (rain and snow) from September 1979 to August 1980 was slightly less than 4. Based upon pH data from the literature for this area, the present pH level represents a 26-fold increase in the H^+ concentration during the last 25 years. Most of the pH depression is thought to evolve from anthropogenic sources. In view of this, weekly park wind rise and episodic air mass trajectories are being assessed by the Na-

tional Climatic Center. These data will be correlated to wetfall chemistry. Physical and chemical responses of park streams to the depressed pH of wetfall are being assessed at two study sites using remote monitoring systems. Stream pH has been depressed by as much as one unit following some storms. The shovel-nosed salamander has been tested in 7-day acute toxicity bioassays to estimate the toxicity of pH depressions on aquatic life. The studies have shown that the depressions can be in the acute toxicity range, but the pH does not remain at the low levels long enough to be acutely toxic under present conditions.

(115)

Changes in Standing Crop of Brook Trout Concurrent with Removal of Exotic Trout Species from Selected Great Smoky Mountains National Park Streams

Stephen E. Moore,¹ Bromfield Ridley,¹
and Gary L. Larson²

*Tennessee Technological University¹ and
National Park Service²*

The brook trout is the only salmonid species native to the Great Smoky Mountains National Park. The range of the species has declined about 70% in the park during the last 75 years. Much of this decline is attributed to the encroachment of rainbow trout into the streams. In view of these changes in brook trout range, an investigation was conducted from 1976 to 1979 to determine the feasibility of removing rainbow trout by electrofishing and to determine the response of the brook trout populations to the removal. Six headwater streams were included in the study. A two-man electrofishing crew was able to substantially reduce the numbers and standing crop of rainbow trout in each stream, but the species was not eradicated. This reduction apparently did contribute to an increase of brook trout as their standing crop and number increased markedly in most study streams.

(116)

Notes on Spawning of the Brindled Madtom, *Noturus miurus* Jordan, in a West Virginia Stream

Curtis H. Hardman
Marshall University

Observations on spawning of Brindled Madtoms were made in the West Fork of Twelvepole Creek, West Virginia. Spawning commenced at a water temperature of 23°C in late June and continued through August. Nesting occurred in cans and bottles with a mean opening diameter of 22 mm. Nest sites were located in pools at depths of 0.15–0.50 meters with a sand substrate. Males occupied nests before females and guarded eggs after spawning. Egg counts had a range of 35–95 and a mean of 62. Spawning males and females had mean lengths of 95 and 84 mm, respectively.

(117)

Seasonal Gonadal Changes and Population Structure of *Noturus munitus* (Pisces: Ictaluridae) in Mississippi

Stanley E. Trauth, Gary L. Miller,
and John S. Williams

Georgia Southwestern College, Mississippi State University, and University of Alabama

Seasonal changes in gonadal morphology and tissue characteristics of *Noturus munitus* were determined by microscopic and macroscopic examination of 20 female and 22 male specimens from the Tombigbee River in Mississippi. *Noturus munitus* testes were lobate (typical of Ictaluridae) with many fingerlike projections. In June, spermatozoa were abundant in cysts of the anterior lobes. Recrudescence of the germinal epithelium began in August. Spermatogonial divisions occurred from October to May, and spermiogenesis occurred from June to July. Mature females averaged from 50 to 70 yolk follicles per ovary and the largest yolk follicles averaged 2 mm in length. The first post-ovulatory follicles (corpora lutea) were observed in July. All corpora lutea were similar in size indicating that all eggs were spawned at one time. Atritic follicles were occasionally observed in spent ovaries in July and August. Ovaries remained regressed until March and spawning appeared to be restricted to summer months. Analysis of length-frequency data indicated coincidental changes in population structure.

(118)

Trophic Ecology of the Freckled-belly Madtom, *Noturus munitus* (Pisces: Ictaluridae)

Gary L. Miller and John S. Williams
*Mississippi State University and
University of Alabama*

Thirty-six external morphological features of specimens of *Noturus munitus* from the Tombigbee River in Mississippi were measured. Gut contents were analyzed and trophic diversity, average food size, relative volume and percentage occurrence of food items were determined. Seasonal changes in feeding patterns were observed. Seasonal differences in feeding were related to changes in population structure. Ontogenetic changes in feeding preferences were related to aspects of the trophic morphology. The applicability of the Principal Component Regression analysis in the study of trophic ecology was determined.

(119)

Cytophotometric Determinations of DNA During Gametogenesis in *Poecilia*

Paul J. Monaco,¹ Ellen M. Rasch,¹
and Joseph S. Balsano²

*East Tennessee State University¹ and
University of Wisconsin-Parkside*

Amounts of DNA in individual Feulgen-stained nuclei from ovaries and testes of melanistic hybrids of *Poecilia latipinna* were determined with a Vickers M86 integrating microdensitometer, using red cell nu-

clei of chicken and *Xenopus laevis* as internal reference standards of 2.5 pg and 6.35 pg DNA/cell, respectively. Granulosa and oogonal nuclei contain roughly 1.7 pg DNA; whereas, oocyte nuclei from leptotene through early diplotene contain 3.4–3.5 pg DNA, indicating completion of premeiotic DNA synthesis before the onset of meiotic prophase. The DNA content of primary spermatocytes at zygotene or metaphase I is approximately 4 times that found for young, haploid spermatids. Rarely, mature sperm are found containing twice the DNA level of typical spermatozoa, suggesting that some perturbation of the second meiotic division is possible in these fish. The analytical methods described here will be directly applicable to our studies of meiotic mechanisms in naturally occurring bisexual-unisexual breeding complexes involving the Amazon molly, *Poecilia formosa*. Supported in part by National Science Foundation grant DEB78 07753.

(120)

Histological Examination of Intersexual Mosquitofish, *Gambusia affinis* (Pisces: Poeciliidae)

Dale T. Drysdale
University of West Florida

Naturally occurring populations of intersexual *Gambusia affinis* have been documented in which genotypic females display male secondary sex characters (arrhenoidy), while genotypic males exhibit precocious secondary morphological sex characters. Such populations have been found only in waters receiving effluent from pulp and paper mills. Histological studies indicate possible physiological mechanisms leading to the intersex condition, as well as gross cellular responses to the effluent. The relationships of the pituitary-gonadal, and pituitary-adrenocortical axes to this phenomenon will be discussed.

(121)

Additional Evidence for Environmentally Induced Intersexuality in Poeciliid Fishes

Stephen A. Bortone and Dale T. Drysdale
University of West Florida

Several collections of fishes from the Fenholloway River, Taylor County, Florida, revealed evidence of intersexuality similar to that previously described occurring in *Gambusia affinis* from Eleven Mile Creek, Escambia County, Florida. In the Fenholloway River female *Heterandria formosa*, *Poecilia latipinna*, and *Gambusia affinis* display male secondary sex character development in the form of gonopodial modification of the anal fin. These arrhenoid fishes were present only in the main river, downstream of the point source of paper-mill effluent. Substantial evidence now exists indicating a compound or compounds in paper-mill effluent as at least a partial causative factor.

(122)

Temporal Pattern of Maturation in the Male Sailfin Molly, *Poecilia latipinna* (Pisces)

Franklin F. Snelson, Jr.
University of Central Florida

In a study population from east-central Florida, immature males of the sailfin molly (*Poecilia latipinna*) do not transform into sexually mature adults uniformly throughout the year. Instead, there appears to be large-scale synchronous maturation in the late fall months. Although a small number of immatures may attain maturity at other times of the year, most mature males present in the population through the winter, spring, and summer matured the preceding fall. The data are preliminary at the time of this writing.

(123)

Reproduction of the Weed Shiner, *Notropis texanus* (Pisces: Cyprinidae), in Southeastern Mississippi

Drew Davis and David C. Heins
Millsaps College

The results of analyses of collections of the weed shiner, *Notropis texanus*, taken in the Jourdan River drainage system, Hancock County, Mississippi, will be described. We will consider the reproductive period, fecundity, and size of mature eggs in our report.

(124)

A Systematic Study of an Unusual Population of the Coldwater Darter, *Etheostoma ditrema* (Pisces: Percidae), in Shelby Co., Alabama

P. S. Utter and J. S. Ramsey
Auburn University

Etheostoma ditrema, the coldwater darter, is an inhabitant of limestone springs and spring runs in the Coosa River drainage system of Alabama, Georgia, and Tennessee. Populations of darters at several locations in Shelby Co., Alabama, have been tentatively listed as conspecific with *E. ditrema*; however, these are aberrant enough to warrant further taxonomic investigation. Such a study is of special interest because of the proposed threatened status of *E. ditrema*. Preliminary morphological studies were done which suggested the Shelby Co. populations may be intergrades of *E. ditrema* and *E. swainii*, a closely related species occupying a more southern range. A comparative electrophoretic analysis of isozyme patterns in tissues from *E. ditrema*, *E. swainii*, and the Shelby Co. populations in question was initiated to help clarify and taxonomic status of the aberrant populations. The taxonomic implications of the morphological and biochemical data will be discussed.

(125)

An Aquaria Study of Social Behavior of the Blackbanded Darter, *Percina nigrofasciata* (Osteichthyes: Percidae)

Robert Stiles and Larry Eldridge

Samford University

The social structure and behavior of *Percina nigrofasciata* was examined in two aquaria colonies maintained from 11 July 1978 to 20 July 1979 and from 25 February 1980 to 6 August 1980. The 1978-1979 colony consisted of two males and two females housed in a 284 liter aquarium. The two largest fish, at first, established territories but changing the habitat in the tank precipitated the breakdown of territoriality and the development of a size dependent dominance hierarchy. Introduction of a larger male and removal of one of the subdominant fish resulted in a change in the hierarchy, as did food deprivation. The 1980 colony consisted of two females and four males housed in a 568 liter aquarium. These fish maintained a dominance hierarchy. Various social and some reproductive behaviors were observed.

(126)

The Reproductive Behavior of *Percina nigrofasciata* (Osteichthyes: Percidae)

Larry Eldridge

Samford University

During the spring of 1978 a study was undertaken to examine the reproductive behavior of the black-banded darter, *Percina nigrofasciata*. The study was conducted in Little Cahaba Creek, Jefferson County, Alabama using face mask and snorkel for observations. During the course of the study four breeding pairs were observed for a total of seven spawning acts. Observed behaviors included courtship ritual, spawning act, and reaction to outside stimuli. Typical breeding habitat was also noted during the course of the study.

(127)

Food Habits of the Blackbanded Darter, *Percina nigrofasciata* (Pisces: Percidae), in the Cahaba River, Alabama

Werner Wieland

Auburn University

An analysis of the food habits of *Percina nigrofasciata* was conducted by examining 97 specimens as part of an ongoing life history study. Both diet and feeding periodicity were determined based on frequency of occurrence, percentage of total number, and percentage of total weight of organisms. Percentage of total weight and percentage of total number were then compared to relative abundance of organisms in drift and bottom samples. Commonly occurring organisms

in the diet of *Percina nigrofasciata* were Hydropsychidae, Baetidae, Chironomidae, and Simuliidae. Food habits in this study are compared with those of an earlier study conducted on a Chattahoochee River population.

(128)

Spawning and Nesting Behavior in the Waccamaw Darter, *Etheostoma perlongum* (Pisces: Teleostei)

David G. Lindquist, John R. Shute, and Peggy W. Shute

University of North Carolina at Wilmington

The spawning and nesting behavior of *Etheostoma perlongum* was investigated in the field and laboratory. Sexual dimorphism is highly developed in such features as genital papillae, first dorsal and paired fins, and nuptial coloration. A reproductive migration from mid-lake to shore occurs in the spring; males precede females to select nest sites under submerged sticks and other debris. The male excavates a depression beneath the submerged object. Gonad analysis indicates a single spawning season extending from March through June. Nests were found from late April to mid-June and were guarded by single males for periods of 13 to 36 days. Males initiate courtship by lateral display, lead the female to the nest site and show the nest by inverting. The female responds by tail up, tail wag and circle. Males also tail wag and circle. Spawning pairs invert, usually in unison, and orient head to head or, less often, head to tail. The female deposits eggs while holding her body in a weak "S" or "J" shape while vibrating.

(129)

Spawning Success of the Waccamaw Darter, *Etheostoma perlongum* (Pisces: Teleostei), Under Artificial Substrates

L. Michael Jones, David G. Lindquist, J. R. Shute, and P. W. Shute

University of North Carolina at Wilmington

Etheostoma perlongum is a darter endemic to Lake Waccamaw, North Carolina. An experiment was conducted in the spring of 1979 utilizing two different artificial substrates to determine: 1) preference for 20 cm square ceramic tiles or 0.5 m lengths of half round 10 cm diameter polyvinyl coring (PVC) pipe; 2) general spawning habitat preference; 3) egg production for each spawning substrate in four habitats; and 4) temporal spawning patterns in each habitat. Six stations were selected: one over shallow sand; two shallow vegetated habitats; two medium depth vegetated habitats; and one over deep sand. Results indicate: 1) darters showed a decided preference for the tile substrates; 2) all habitats were utilized by spawning darters; 3) during April sandy unvegetated habitats had greater utilization by nesting males but egg production did not differ much among the four habitats; 4) during May the two shallow habitats had higher use rates; and 5) spawning activities had virtually ceased by June 11.

(130)

Age, Growth, and Larval Development
of the Waccamaw Darter, *Etheostoma
perlongum* (Pisces: Teleostei)

Peggy W. Shute, John R. Shute,
and David G. Lindquist

University of North Carolina at Wilmington

From 1976 to 30 August 1980, a total of 523 specimens of *Etheostoma* (*Boleosoma*) *perlongum* have been collected and catalogued. The scale method was used to determine the ages of 179 of these specimens collected from March 1979 through June 1980. Scales were removed from the right side of the fish, posterior to the first dorsal insertion and approximately three scales above the lateral line. We find from the scale readings and length frequency histograms that this Lake Waccamaw population of *Boleosoma* is an annual one, unlike most other darters and any other *Boleosoma*. The oldest possible age for any specimen found to date is 16 months. Larvae reared from laboratory aquarium spawning hatched between 168 and 187 hours at 20–23°C, and range from 3.3 to 6.1 mm TL at hatching. Growth is rapid and the age at which half adult size is reached is 4–8 weeks.

(131)

Growth, Diet and Distribution of
Yellow Perch Fry, *Perca flavescens*
(Mitchill) in Lake Itasca,
Minnesota

C. Michael Swindoll

University of Tennessee

The growth, diet and distribution of Yellow Perch fry were determined from perch fry collected during the summers of 1978, 1979, and 1980 from Lake Itasca, Minnesota. Perch hatched in the littoral zone at 5.5–6 mm total length. Within 10–12 days all fry had moved into the pelagic zone, where they remained until reaching a length of approximately 24–28 mm; at this time they migrate back into the littoral area. During the first 60 days after hatching, perch fry grow in length approximately 0.5 mm per day. Growth rates for the remainder of the summer were lower, averaging approximately 0.35 mm per day. Fry first fed at 9–10 mm in length on a diet composed of copepodids, nauplii and rotifers. Copepods remained the dominant food item until fry reached 20–24 mm in length, at which time Cladocera became the dominant food. Larger food items, such as insects and amphipods were important in the diet of perch fry greater than 35 mm in length.

(132)

Diet Overlap Between the Mississippi
Silverside (*Menidia audens*) and Juvenile
Largemouth Bass (*Micropterus salmoides*)
in False River, Louisiana

A. Richard K. Wallace, Jr.
Auburn University

Mississippi silversides and juvenile largemouth bass (12–51 mm standard length) were collected every 6

hours for 24 hours in May of 1979 from False River, Louisiana. Stomach analysis revealed that the two species shared 12 of 18 food categories, but utilized them in strikingly different proportions. Copepods and chaoborid pupae were most important in the diet of Mississippi silversides while mysid shrimp, Ephemeroptera, and fish were most important to juvenile largemouth bass. An overlap index was calculated using each of three proportional food measures: the percentage of total number, the percentage of total volume, and the average of the volume percentages. Additional overlap values were calculated excluding fish from the diets, for different times of collection, and different size classes of both species. Twenty-six of the 27 resulting values of overlap (0.1–0.48) showed no significant overlap (≥ 0.60). Overlap for the smallest fish of both species using the percentage of total number was significant (0.67).

(133)

Pond Cypress, *Taxodium ascendens*
Brongn. or *T. distichum* (L.) Rich.
var. *nutans* (Ait.) Sweet?

Frank D. Watson

North Carolina State University

The taxonomic treatment of pond cypress has remained variable since the early 1800's. Some authors regard it as a distinct species (*Taxodium ascendens* Brongn.), others as a variety of bald cypress (*T. distichum* (L.) Rich. var. *nutans* (Ait.) Sweet), and some regard it as a minor variant not worthy of formal taxonomic recognition. Two previous studies which addressed this problem utilized different types of evidence and reached different conclusions. Results from a comparative systematic study of bald cypress and pond cypress will be presented as well as the author's decision regarding the nomenclatural status of pond cypress. Supported by a grant from the U.S. Forest Service.

(134)

Reproduction in *Saxifraga careyana*,
Saxifraga caroliniana, and
Saxifraga michauxii

R. Michael Weber

North Carolina State University

Saxifraga careyana, *S. caroliniana* and *S. michauxii* are Southern Appalachian endemics. These species are being studied using the "Species Biology" method. The discussion will include pollinators, pollinator behavior, breeding mechanisms, and seed set for each of the species. Supported in part by a Grant-in-Aid from The Highlands Biological Station.

(135)

Flavonoid Study of South American
Vernonia: Series *Flexuosae* (Compositae)

Bruce L. King and Samuel B. Jones
Randolph-Macon College and
University of Georgia

Series *Flexuosae* appears to be a natural group based on morphology and pollen grain type and this

is supported by the flavonoid data. Twenty-nine flavonoids were detected in the series which occurred in species-specific ensembles. All species of the series appear to have 6- and 8-C-glycosyl flavones. Methylated flavonoids are common in the group but are not present in all species. It is suggested on morphological and chemical grounds that the center of distribution for the group is south-central Brazil and that the more southerly distributed species are more recently derived.

(136)

Chasmogamy and Cleistogamy in
Chaptalia seemannii
(Asteraceae: Mutisaceae)

Guy L. Nesom

Memphis State University

Two different types of capitula are produced by individual plants of *Chaptalia seemannii* (Sch.-Bip. in Seem.) Hemsl., a rosette-forming perennial distributed in mountainous regions from Guatemala through Mexico and into New Mexico and Arizona. Chasmogamous capitula are borne on short peduncles before or concurrently with the emergence of the leaves in Jan-Jun. These heads are radiate and have relatively large, bilabiate hermaphroditic flowers. The cleistogamous heads are borne on much longer peduncles in Jul-Nov, well after the leaves have expanded to mature size. The involucre bracts of these never open, the pistillate flowers are eligulate or produce only very short, filiform ligules, and the hermaphroditic flowers are nearly actinomorphic and much narrower than in the chasmogamous heads. Preliminary observations suggest that the cleistogams also produce larger and a greater number of achenes than the chasmogams. Cleistogamy is a rare phenomenon in the Asteraceae. As a result of the lack of recognition of this feature and other types of confusing variability in these plants, both forms of *C. seemannii* have previously been known by different sets of synonyms.

(137)

Occurrence and Anatomy of Hydathodes
in *Physocarpus* (Rosaceae)

John D. Curtis and Nels R. Lersten

University of Wisconsin-Stevens Point and
Iowa State University

Leaves from herbarium specimens of the six currently recognized species were cleared and stained. Hydathodes occur in all species but they are reduced in size and number in some specimens, particularly of *P. alternans*, *P. capitatus*, and *P. monogynus*. In some leaves of western US species a gland occurs with, or instead of, a hydathode. Hydathode anatomy was studied in field-fixed leaves of *P. opulifolium* using clearings and paraffin sections for light microscopy, and scanning electron microscopy. Each leaf tooth has one hydathode consisting externally of a raised adaxial pad studded with small sunken water pores (modified stomates). Internally, there is an enlarged vascular bundle ending with xylem and phloem, beyond and/or above which extends an epithem of small

cells with small intercellular spaces. The epithem is bounded by a tanniferous bundle sheath extending nearly to the surface. All water pores seen were closed, some were covered by cuticle. Previous studies have suggested that water pores are open permanently. The previously unknown hydathodes of *Physocarpus* appear well suited for more detailed anatomical and physiological study.

(138)

GLC Identification of Monosaccharides

James W. Wallace

Western Carolina University

Sixty-eight monosaccharides or their derivatives were analyzed by GLC. The R_f 's, relative to β -glucose were calculated before and after refluxing. The reflux conditions were typical of those employed in flavonoid analyses. The R_f values were determined by chromatographing the trimethylsilyl ether-derivatives of the sugars on 3% SE-52, 3% Poly-A 101A, and 3% OV-1. The monosaccharides analyzed included 2 tetroses, 13 pentoses, 50 hexoses, and 4 heptoses. Problems were encountered with 2-deoxy sugars and ketoses. Prior to acidic treatment good peaks were obtained using these latter sugars; however, after refluxing, peaks were not obtainable. This will be considered as a problem of natural product identification. The value of this work lies in demonstrating the distinctness of each monosaccharide using a "teaching grade" instrument.

(139)

The Use of C-glycosylxanthones as
Phylogenetic Markers Within the
Leptosporangiate Ferns and
Their Allies

James W. Wallace

Western Carolina University

C-glycosylxanthones have rarely been encountered during chemical surveys of the plant kingdom. Even though all groups of land plants have been surveyed for polyphenolic compounds, C-glycosylxanthones have only been reported in a few flowering plants and two fern genera (*Asplenium*, *Athyrium*). The present study is a survey of 410 species within the lower vascular plants for 1,3,6,7-tetrahydroxy-C-glycosylxanthones. The results indicate a limited distribution of these compounds within three leptosporangiate families: Hymenophyllaceae, Aspleniaceae and Marsileaceae. In the Hymenophyllaceae the distribution of these compounds appears to be a useful criterion for segregating the species of *Mecodium* from other species of *Hymenophyllum* (*sensu lato*) and indicates that the tubulate vs. the valvate indusial condition may not be an ideal character for separating all species of *Hymenophyllum* *s.l.* from those of *Trichomanes* *s.l.* These compounds appear useful for delimiting several species of *Elaphoglossum* section *Pachyglossa* and support a relationship among the Aspleniaceae, Athyriaceae and Elaphoglossaceae. Their presence in *Marsilea* also raises questions as to the origin of this group of plants.

(140)

C-glycosylflavones of Representative Species of the Gnetales

Pat Porter and James W. Wallace

Western Carolina University

The Gnetales, consisting of the genera *Gnetum*, *Ephedra* and *Welwitschia* has always been considered as a morphologically distinct group of seed plants. The present limited study suggests that C-glycosylflavonoids may be characteristic of the three genera comprising this order. The flavonoids were identified using the standard techniques of Mabry *et al.* (1970) and Bouillant *et al.* (1975). The following flavonoids have been identified: *Welwitschia mirabilis*: 6,8-di-C-glucosyl-luteolin its 4'-O-methylether and 6-C-glucosyl-chrysoeriol; *Ephedra antisiphyletica*: lucenin-1,2 and 3 and vicenin 1,2 and 3; *Gnetum gnemon*: 6-C-, 8-C- and 6,8-di-C-glucosyl derivatives of apigenin, luteolin and their 7-O-methylethers. Other flavonoids have not been detected. The phylogenetic significance of these results will be discussed.

(141)

A Numerical Taxonomic Study of Western Hemisphere *Hydrolea* (Hydrophyllaceae)

L. J. Davenport

University of Alabama

The most recent taxonomic treatment of *Hydrolea*, published in 1913, recognized 14 species in the Western Hemisphere. Due to the large amount of variation noted, eight varieties, one subvariety, and six forms were also designated, with many of these being sub-specific taxa of *Hydrolea spinosa*. Numerical taxonomic methods, including cluster analysis and discriminant analysis, have proven useful in analyzing the variation within *Hydrolea*, as well as in the delimitation of species. The results of these analyses and their effects upon *Hydrolea* taxonomy will be discussed.

(142)

A Revision of the Genus *Lysiloma* (Leguminosae)

Ralph L. Thompson

Berea College

Lysiloma is a small poorly-known group of unarmed, woody tropical and subtropical American legumes in the tribe Ingeae of the subfamily Mimosoideae. The unique legume type and prominent foliaceous stipules are diagnostic features of *Lysiloma* within the tribe Ingeae. The distribution of the genus extends from Costa Rica northward through Central America and Mexico into southern Arizona, and eastward from Mexico to the Greater Antilles, the Bahamas, and southern Florida. Morphological and geographical data were compiled and correlated from over 4000 herbarium specimens drawn from 30 herbaria in Mexico, Central America, Jamaica, England, and the United States, and from an intensive literature survey. A conservative or broad species concept has been followed in this revision. Nine distinct species are recognized. Two subgenera are described within *Lysiloma* based on the characteristics of the legume

dehiscence and subsequent seed release. Subgenus *Lysiloma* features legumes tardily dehiscent or indehiscent after maturity. Two species assigned to this subgenus are *L. sabicu* Benth. and *L. latissiliquum* (L.) Benth., the type species of the genus. Subgenus *Lysivalva* features legumes readily dehiscent at maturity and consists of two sections. Section *Capitata* includes *L. tergeminum* Benth., *L. candidum* Br. degee, *L. divaricatum* (Jacquin) Macbride, and *L. microphyllum* Benth. Section *Racemosa* includes *L. watsonii* Rose, *L. acapulcense* (Kunth) Benth., and *L. auritum* (Schlechtendal) Benth.

(143)

Revision of *Piptocarpha* R. Br. in Peru (Compositae: Vernoniaeae)

Gerald L. Smith

University of Georgia

Piptocarpha, consisting of ca. 40 species, is a widely distributed tropical genus extending southward from the West Indies and Central America into northern and central South America. The major center of distribution is the central and southern highlands of Brazil, but a secondary center of distribution is the northern and central Andes. *Piptocarpha* in Peru has been revised using standard herbarium techniques with a reduction in the number of species recognized from 14 to 7. Preliminary data from the analyses of leaf flavonoids strongly suggest their utility in delimiting species and in indicating evolutionary relationships. The revision of *Piptocarpha*, being accomplished through experimental as well as traditional methods, will result in a modern and predictive classification of the genus.

(144)

Systematics of *Eremanthus* Less. (Compositae: Vernoniaeae)

Nanda F. MacLeish

University of Georgia

Eremanthus Less., tribe Vernoniaeae, comprises syncephalous herbs, shrubs and trees largely restricted to the Central Brazil Plateau of South America. The systematics of *Eremanthus* has not been reevaluated since Baker (1873); a comparison of Baker's treatment with those of De Candolle (1836) and Schultz-Bipontinus (1861, 1863) suggests a less than optimal understanding of generic and specific boundaries within these species' groups. A comprehensive literature review suggests that there are about 33 species currently included in *Eremanthus*; however, the closely related genera *Albertinia* Spreng., *Blanchetia* DC., *Chresta* Vell., *Glaziovianthus* Barroso, *Pithecozeris* DC. and *Vanillosmopsis* Sch. Bip., members of which also exhibit relative degrees of syncephaly, may contribute another 17 taxa. The plethora of names introduced by post-Baker authors further suggests a paucity of both herbarium materials with adequate documentation and supplementary data such as cytological, palynological or ecological. Preliminary investigations utilizing such data sources suggest the polyphyletic origin of *Eremanthus*.

(145)

Karyotype Relationships in Native New World *Vicia* (Leguminosae)

Stuart Lassetter and Sudaratana Veerasethakul
Eastern Kentucky University

The genus *Vicia* in the New World consists of a mixture of native species as well as naturalized Old World taxa. Since the 1920's and 1930's, karyotypes have been recognized as valid taxonomic characters at the species level. Karyotype work has, however, been limited almost entirely to species native to the Old World. The present study presents karyotypes for 11 of the 35 species native to the Americas. Karyotype relationships are correlated with the most recent world-wide infrageneric *Vicia* treatment which did not utilize karyotype data. First chromosome counts are also presented for seven species.

(146)

Flavonoids of Vernoniae (Compositae): Taxonomic Value

John G. Stutts
University of Georgia

Flavonoid reports in the Vernoniae have been largely confined to the genus *Vernonia*. Other genera which have received some detailed attention include *Centratherum*, *Corymbium*, *Elephantopus*, *Eremanthus*, *Ethulia*, *Haplophylu*, *Stokesia*, and *Vanillosmopsis*. This is a total of only nine in a tribe containing ca. 70 genera. Recently several flavonoids have been elucidated from various taxa in the genera *Pollalesta*, *Piptocarpha*, *Piptocoma*, *Lychnophora* and *Haplostephium*. The identity of these compounds and the possibility of utilizing flavonoids as taxonomic characters at the intergeneric level in the tribe Vernoniae will be discussed.

(147)

The Use of Polygonal Diagrams in a Phylogenetic Study of the Gentianaceae

Bruno F. Kowalczyk and Jeanne Stuart
University of South Carolina

Phylogenetic analysis of multiple characteristics can be facilitated by the use of the polygonal diagram in which relationships may be visualized in two dimensions. Eighteen-character polygonal diagrams were used to analyze the relationships of the Gentianaceae with several other plant families. While many similarities were apparent between the families, the greatest degree of congruity was observed between the Gentianaceae and the Polemoniaceae. By this technique, the Primulaceae also appear to have greater affinities with the Gentianaceae than are generally ascribed. A review of a greater quantity of characteristics in even more complete polygonal diagrams would shed more light on the discovery of a true evolutionary picture.

(148)

The Separation of Closely Related Fungi by Infrared Spectrophotometry

John D. Reynolds and Peter E. Giebel
Virginia Commonwealth University

The absorption bands of various *Rhizopus* species were examined by infrared spectrophotometry and their absorption bands compared. Preparation for scanning was as follows: each species was harvested at the stationary growth phase; sterilized at 97°C for 15 minutes; washed repeatedly with distilled water to remove any adhering growth medium; the mycelia was placed in small Petri dishes and lyophilized; the lyophilized mycelia (0.8–1.5 mg) was mixed with dry KBr powder (100–250 mg); placed in a KBr pellet die and subjected to approximately 150 atmospheres pressure. The prepared pellet was scanned in a P & E model 337 infrared spectrophotometer. Regions of similar absorption bands were selected as characteristic of the genus and on the basis of variations in shape, intensity and presence/absence of absorption bands, species were then separated.

(149)

A Taxonomic Study of the *Hydrangea arborescens* Complex (Saxifragaceae)

R. E. Pilatowski
The Ohio State University

The taxonomic treatments of the common *Hydrangeas* of the eastern United States have varied over the years. The most recent treatment, that of McClintock in 1957, recognizes a single species, *Hydrangea arborescens*, with three subspecies—*arborescens*, *discolor*, and *radiata*. The subspecies are based on vestiture type, trichome features, frequency of sterile flowers, and geographical distribution. Studies were carried out in the southern Appalachians, where these three taxa are sympatric. The purpose of the investigation was to determine the patterns of variation within and between the subspecies in order to evaluate the validity of their taxonomic recognition. The methods employed included: (1) field studies of populational variation; (2) morphology; (3) comparative flavonoid chemistry, and (4) experimental hybridizations. Based upon the results of these studies, it is proposed that the three subspecies be recognized as species, namely *Hydrangea arborescens* L., *Hydrangea cinerea* Small, and *Hydrangea radiata* Walter.

(150)

Conochea Aubl. and Related Taxa (Scrophulariaceae): A Preliminary Survey

Bruno F. Kowalczyk and J. M. Herr, Jr.
University of South Carolina

Several genera of the tribe Gratioleae (Scrophulariaceae) have been examined. These genera are listed as *Conochea* Aubl., *Leucospora* Nutt., *Schistophragma* Benth., and *Sphaerotheca* Cham. & Schlecht. Apparently these genera are phylogenetically related to the point of causing considerable synonymy and confusion. Examination of specimens from several herbaria has indeed indicated close relationship be-

tween these genera. It appears that species of these taxa could easily belong to the same genus with *Schistophragma intermedia* (A. Gray) Pennell, *Conochea polystachya* (Brandegee) Minod, and *C. scoparioides* (Cham. & Schlecht.) Benth. as intermediate types. This is supported by schemes of Bentham (1846) and Wettstein (1897) who organized these taxa to be included under the single genus, *Conochea*.

(151)

Nomenclatural History of *Dicerandra*
(Labiatae)

Robin B. Huck

University of North Carolina, Chapel Hill

Dicerandra, a labiate genus endemic to the southeastern coastal plain of the United States, is recognized by its unusual spurred anthers which dehisce transversely. It has five recognized species: *D. linearifolia* (Ell.) Benth., *D. densiflora* Benth., *D. odoratissima* Harper, *D. immaculata* Lak. and *D. frutescens* Shinnars. The latter, found in the sandhills and scrub of the Central Florida Ridge, is on the Threatened List for that state. After its original collection, naming and description as *Ceranthra*, based on *Ceranthra linearifolia*, by Stephen Elliott in 1821, *Dicerandra* became the subject of transatlantic correspondence between English and North American botanists. The details of letters and notations of George Bentham, William Hooker, John Torrey and Stephen Elliott aid in the clarification of the nomenclature of this genus and its included species.

(152)

Ecological Studies of an Old-field
Weed: *Ipomoea hederacea*

A. Dennis F. Whigham and Deborah Orbach

Smithsonian Institution

Ipomoea hederacea is the dominant broad-leaved annual in cultivated fields of the Inner Coastal Plain of Maryland. Following abandonment, *Ipomoea* quickly disappears from the old-field community. A large buried seed pool, however, is maintained and *Ipomoea* populations are quickly re-established following disturbances. In this paper, we report on studies of factors that maintain the buried seed pool as well as studies of *Ipomoea* growth patterns following abandonment. Competition appears to be the primary cause for its removal from the old-field community and there are shifts in patterns of biomass allocation in competitive and non-competitive situations.

(153)

Divergence of Flowering Time in
Talinum (Portulacaceae)

M. Eloise Brown Carter and William H. Murdy

Agnes Scott College and Emory University

The distributions of *Talinum mengesii* and *T. teretifolium* overlap east of Atlanta, and both species to-

gether with their sterile hybrids may be found occupying similar habitats on the same granite outcrops. A comparison of flowering times was undertaken to determine population differences related to contact or lack of contact with the other species. Ten populations of each species, including five with and five without contact, were sampled over a hundred mile transect, grown in the greenhouse for six weeks and scored for time of first flower opening. *T. teretifolium* populations initiated flowering from 2:50 to 3:45 pm. *T. mengesii* populations separated into two distinct groups. Those in contact with *T. teretifolium* initiated flowering from 1:05 to 1:25 pm, while the populations without contact began flowering between 1:50 and 2:10 pm. These data suggest divergence of diurnal flowering times and may be an indication of character displacement in the genus *Talinum*.

(154)

The Effect of High Relative Humidity
and SO₂ on the Sexual Reproduction of
Talinum teretifolium (Portulacaceae)

Denis T. DuBay and William H. Murdy

Emory University

The effect of high relative humidity (RH) and SO₂ on sexual reproduction was tested by treating *Talinum teretifolium* plants for an 8 hour period during anthesis. High relative humidity alone had an adverse effect on plant fertility. *In vivo* pollen germination was lower above 95% RH than at 70% RH. Percent capsule formation and seed set was lower at 90% RH than at 70% RH, and again lower at 95% RH than at 90% RH. Exposure to 0.6 ppm SO₂ for 8 hours at 85% and 90–95% RH had no significant effect on either capsule or seed formation. The tolerance of sexual reproduction in *Talinum teretifolium* to SO₂ is compared to that of other species.

(155)

The Effect of SO₂ on Sexual
Reproduction in *Talinum mengesii*: Wolf
Plants Pollinated by Few Pollen Grains

William H. Murdy

Emory University

Experiments were done to test the hypothesis that an adverse impact of SO₂ on pollen germination and pollen tube growth in *Talinum mengesii* is masked by the fact that stigmas normally carry a surplus of pollen grains. Plants with an average ovule number of 52 were pollinated using 30 and 40 pollen grains per stigma and placed in either control or fumigation chambers for 5 hours. Fumigated plants, exposed to 0.6 ppm SO₂, set a greater percentage of fruit than control plants. Some fruit borne by fumigated plants contained as few as 5, 6, and 7 seeds, whereas 8 was the lowest number of seeds in fruit of control plants. The average number of seeds per fruit in control and fumigated sets of plants was not significantly different.

(156)

Collection Pressure, Population Structure and Survival of Ginseng (*Panax quinquefolium*) in North Carolina: A Preliminary Report

Robert Sutter¹ and Laura Mansberg²

¹Plant Conservation Program, N.C. Department of Agriculture, ²and North Carolina State University²

Present regulations of the U.S. Fish and Wildlife Permit Office require states desiring to export Ginseng (*Panax quinquefolium*) to maintain a monitoring program to assess the status of the species in that state. The goal of such a program is to ascertain that collection of Ginseng is not detrimental to the continued existence of the species. Data from two years of population monitoring in North Carolina will be presented. Included will be data on fecundity, seed set, collection, and aspects of demography. Comparisons will be made between presently collected populations and uncollected populations. Several population projection matrices will be discussed and the results used to predict the survival and vigor of these native populations.

(157)

Phyllodia in the Pitcher Plant
Sarracenia flava L.

T. Edward Weiss, Jr.

Christopher Newport College

The presence of both carnivorous and non-carnivorous leaves in the pitcher plant *Sarracenia flava* L. is considered from a nutrient availability standpoint. Different field populations of mature *S. flava* were burned in winter and summer or fertilized with or without the prevention of carnivory. Nutrient removals from the system promoted pitcher production. Phyllodia production was enhanced by nutrient additions. Fertilization studies with seedlings of *S. flava* gave similar results: phyllodia production was stimulated at the highest fertilization levels. The production of phyllodia in this species of pitcher plant does not appear to be solely a phenological response but a response influenced by the overall availability of nutrients to the plant.

(158)

Demographic Studies of Camphorweed,
Heterotheca subaxillaris (Compositae)

Rebecca R. Sharitz

Savannah River Ecology Laboratory

Heterotheca subaxillaris is a weedy composite abundant in old fields and disturbed sites on sandy soils throughout the Southeast. Although occurring primarily as a winter annual, the species demonstrates considerable variability in life history patterns and may function as a biennial or short-lived perennial. Life history characteristics including recruitment, survivorship and reproductive behavior in natural populations have been examined and the relationship between nutlet production and vegetative growth parameters assessed. The ecological significance of dimorphic fruit production and developmental flexi-

bility will be examined in relation to demographic patterns.

(159)

Pollinators of the Orchid *Platanthera*
(*Habenaria*) *ciliaris* (L.) Lindley

Daniel Frame and Katharine B. Gregg

West Virginia Wesleyan College

Pollination studies of a population of *Platanthera ciliaris* in northcentral West Virginia yielded the following butterfly species as the pollinators: *Papilio glaucus* (male and female), *Papilio polyxenes*, *Papilio troilus*, and *Danaus plexippus*. The pollinaria were attached to the compound eyes near the base of the proboscis. An average of 14 pollinaria per butterfly were observed on the major pollinator, *P. glaucus*, with one individual having 38 pollinaria. At any given inflorescence, the butterflies visited approximately 3 flowers. Fresh pollen was observed on the stigma of about 1 flower in every 6 of these visits. Nonpollinating visitors were bees (*Bombus* sp.) and one hummingbird. Three bees were observed with one pollinarium on the region between the eye and the base of the mandible but there was no evidence that they actually carried out pollination.

(160)

Reproductive Biology of the Orchid
Platanthera (*Habenaria*) *ciliaris* (L.)
Lindley in a Wet Meadow in
West Virginia

Katharine B. Gregg

West Virginia Wesleyan College

A population of *Platanthera* (*Habenaria*) *ciliaris*, estimated at 10,000 individuals, was investigated from July–October 1980, in a 15-acre wet meadow in Barbour County, West Virginia. Density ranged from 0 to 7.3 plants/m². In mid-August 61% of the plants flowered, each producing an average of 32.7 flowers. Seed set was 38%, and capsules dehiscent 8 weeks after pollination. Herbivory destroyed 5% of the floral axes; in addition, a fungal pathogen killed 5% of the capsules before they matured. Artificial pollinations carried out in a growth chamber showed the species incapable of autogamy but capable of selfing, outcrossing, and geitonogamy. Examination of rhizomes from flowering plants in late August indicated that 94% had produced new growths, 87% already larger than this season's. Occurring sympatrically were *P. clavellata*, *P. lacera*, *Cleistes divaricata*, *Spiranthes cernua*, *S. gracilis*, and *S. tuberosa*. The biology of these orchids will be compared to that of *P. ciliaris*.

(161)

The Relationship of Time of
Emergence to Survivorship, Growth and
Reproduction in the Annual Grass
Rottboellia exaltata L. f.
(Andropogoneae)

Stephen A. Whipple and James V. LaFrankie, Jr.

Louisiana State University

The time of germination, first flowering and first tillering, longevity and final height for over 600 individ-

uals were recorded by mapping their locations in a nearly pure grass sward. Germination occurred over a two month period and because of this wide range, three emergence classes were delimited. Survivorship curves for early and intermediate germinating individuals were type I, but for tillers as a whole and for late germinating individuals, the curves were much steeper. The early emerging class was taller, lived longer, had a larger proportion of its individuals flowering, flowered earlier, and had more spikes/plant. The differentiation between individuals within this population appears to be due, in large part, to a combination of time of emergence and the spatial relationships between individuals which lead to the development of a competitive hierarchy.

(162)

Influence of Cold Stratification and Temperature on the Germination of *Tripsacum dactyloides*

Roger C. Anderson

Illinois State University

T. dactyloides seeds were collected from three sites in southern Illinois and moist stratified at 4.4°C for 60 or 90 days. Germination tests were conducted at 25° and 32°–34°C following stratification. Significant differences in germination were found between seeds incubated at 25° or 32°C. Seeds stratified for 60 days showed significant differences in germination due to germination temperatures but no differences were found with respect to seed source. However, seeds stratified for 90 days showed significant differences for both germination and seed source.

(163)

The Growth of *Tripsacum dactyloides* L. (Eastern Gama Grass) Under Various Levels of Inorganic Nutrients

Roger C. Anderson

Illinois State University

The growth of eastern gama grass and corn was compared under various levels of inorganic nutrients in sand-water cultures. Six nutrient conditions were established: full, one-half full, and one-quarter full strength nutrient solutions and each of the preceding solutions supplemented with 8 ml of 1 N NH_3NO_3 per liter of solution. Leaf area was monitored during the study and dry weight of roots and shoots and leaf chlorophyll content were measured at the end of the experiment. Total biomass production was about 25 times greater for corn than *Tripsacum*. Proportional decreases in leaf area and biomass associated with lowered levels of inorganic nutrients were similar for corn and gama grass. However, total chlorophyll (mg/g fresh wt.) was greater for *Tripsacum* than corn.

(164)

Wasp Pollination in *Oxypolis* (Apiaceae)

Anne H. Lindsey and C. Ritchie Bell

University of North Carolina, Chapel Hill

Comparative field studies of insect visitation and pollination of *Oxypolis greenmanii* Mathias and Con-

stance and *O. filiformis* (Walt.) Britton have shown marked differences between these species in their degree of specialization for wasp pollination. While the white flowered, wide spread, coastal plain *O. filiformis* has a wide spectrum of insect visitors, typical of most Apiaceae, the maroon flowered endemic, *O. greenmanii*, is visited primarily (75% of all insect visits) by members of the *Sphecidae* or *Vespidae*. Indeed, 30% of all insect visits were made by members of the single vespid genus *Polistes*. In addition to flower color the two *Oxypolis* species provide further differences in pollinator attraction since *O. greenmanii*, as with other wasp pollinated plants, has nectar rich in sucrose while *O. filiformis* nectar is rich in hexose. Also, odor may be important in the attraction of wasps to individual plants of *O. greenmanii* and their fidelity to the population.

(165)

Floral Structure and Differential Insect Visitation in Two Sympatric Species of *Osmorhiza* (Apiaceae)

C. Ritchie Bell and Anne H. Lindsey

University of North Carolina

Although *Osmorhiza longistylis* (Torr.) D.C. and *O. claytonii* are somewhat similar vegetatively, their floral morphology is quite distinct. The larger flowers and inflorescences, and greater proportion of staminate flowers, in *O. longistylis* make it much more conspicuous, and presumably more rewarding to pollen-gathering insect visitors, than *O. claytonii*. These floral differences may account in large part, for a striking differential in both numbers and kinds of insects observed visiting plants of these two sympatric woodland perennials. Fifteen tagged plants of *O. longistylis* were visited by 238 insects belonging to 46 species with 27% Halictidae (Hymenoptera), and 10% each Chrysomelidae, Byturidae and Mordellidae (Coleoptera). An equal number of tagged plants of *O. claytonii* had only 41 insect visitors in 16 species with 10% Halictidae and 35% Chrysomelidae. Despite such differences in insect visitation both species, which are self-fertile, set 89–90% fruit.

(166)

Pollination Efficiency and Fruit Set in *Asclepias syriaca* L. (Asclepiadaceae)

Janis M. Farmer

University of North Carolina, Chapel Hill

Although *Asclepias syriaca*, in our area, normally produces 4–5 inflorescences per stalk with an average of 85 flowers per inflorescence, the average fruit set is less than one follicle per stalk. Field studies of 20 populations of *A. syriaca* in the vicinity of the University of Virginia Mountain Lake Biological Station in 1979 showed that up to 98% of the flowers in a given inflorescence might have pollinia in one or more stigmatic chambers. Indeed, over 50% of the flowers observed had pollinia inserted into two or more stigmatic chambers. Despite such high pollination percentages,

30-90% of the stalks matured no fruit whatsoever. Therefore, quite apart from the strong self-thinning which limits ultimate fruit production per inflorescence, other factors, including self-incompatibility, further act to reduce fruit number to the extent that pollination efficiency in *Asclepias syriaca* bears little or no relationship to ultimate fruit set.

(167)

Food Vacuole Membrane Recycling in the Ciliate, *Tetrahymena vorax*

Maury Smith and Harriett E. Smith

University of Alabama

The process of food vacuole formation and degradation in *Tetrahymena vorax* provides an excellent model for the study of membrane recycling. *T. vorax* is a polymorphic ciliate with a microstome cell type which ingests particulate material by the formation of small vacuoles and a potentially carnivorous macrostome form. Transformation from the microstome to the macrostome cell type involves the replacement of the oral apparatus and development of a large prey receptacle, the cytopharyngeal pouch. This pouch is stimulated to form a closed food vacuole by the calcium added to the medium. After separation, the vacuole decreases in size and moves to the posterior of the cell as a new pouch forms. We have used comparisons of membrane surface area and tracers in conjunction with electron microscopy to investigate the reutilization of food vacuolar membrane for growth of the cytopharyngeal pouch during transformation and reformation after treatment with calcium.

(168)

Essential and Often Neglected Features of the 4½ Clearing Technique

J. M. Herr, Jr.

University of South Carolina

The 4½ clearing technique, specifically designed in 1971 for the study of ovule and megagametophyte development, has been applied subsequently to many aspects of plant and animal histology. Expanded use of the technique has led in some cases to inadequate results which may originate from one or more of the following causes: 1) exclusive use of the original clearing fluid (lactic acid, chloral hydrate, phenol, clove oil, and xylene, 2:2:2:1, by weight) without testing the merits of alternative fluids (e.g., one made by the addition of 1 part benzyl benzoate to the original fluid); 2) failure to support the cover glass over the specimen so that the pressure imposed distorts the clearing image; 3) omission of procedures for pretreatment of the tissue by one of several established methods (e.g., lactic acid at 60°C for 24 hr.); and 4) selection of an ocular-objective combination that does not provide maximal definition and resolution of the clearing image. Attention directed to these four features should lead to a broader application of the technique.

(169)

Enzyme Activity Levels in the Mosquitofish, *Gambusia affinis* Baird and Girard (Poeciliidae)

David J. Henzler

Savannah River Ecology Laboratory and
West Virginia Wesleyan College

Analysis of enzyme activity levels in the mosquitofish, *Gambusia affinis*, was made to determine whether these levels are affected by genetic heterozygosity, sex, location and type of habitat. Samples were collected from lentic, lotic and estuarine environments within a 200 square mile area of the Savannah River Ecology Laboratory, Aiken, South Carolina. Enzyme activity levels were assayed spectrophotometrically for malate dehydrogenase and lactate dehydrogenase at 25 C, 32 C and 37 C. Adenosine deaminase was assayed spectrophotometrically at 25 C. Genetic analyses for 7 enzymes representing 21 loci were assayed using horizontal starch gel electrophoresis. Analysis of data will be presented.

(170)

In Vitro Culture of Embryos Obtained through Inter- and Intraspecific Cross-pollinations in the Genus *Trifolium*

P. T. Evans and E. A. Rupert

Clemson University

Hybrid embryos from interspecific cross-pollinations involving eight species of *Trifolium*, section *Loioidea*, have been successfully grown resulting in eleven hybrid combinations. Embryos were removed from maternal plants at from seven to twenty-one days following pollination and cultured on Murashige and Skoog salt mix with Staba vitamins and various combinations of the growth regulators NAA, IAA, GA, 2-IP and 6-BA. Small torpedo stage embryos from intraspecific crosses were cultured without addition of growth regulators.

(171)

Physcomitrella patens: A Potential Tool for Genotoxicity Testing

Paula A. Collier, Larry W. Jones,
and Karen W. Hughes

University of Tennessee

Few green plant systems are available for genotoxicity testing. A new system is suggested here based upon the moss *Physcomitrella patens* (Hedw.) B.S.G. *P. patens* is a promising tool because 1) it is haploid, 2) clones are readily produced since each cell is totipotent, 3) replica plating techniques are available, 4) the sexual life cycle is short and defined in axenic culture, and 5) several classes of biochemically defined strains have been isolated and proven as true mutant lines.

(172)

Ethyl Alcohol Consumption and its Effect on Blastema Formation in Rabbit Ears

J. L. Robertson and D. I. Pav

East Tennessee State University

Nine mm diameter holes were cut in the ears of anesthetized, large, male rabbits. Regeneration (closure) rates were recorded daily over a ninety day period. Each rabbit served as its own control. The normal healing time for a rabbit was determined by observation of regeneration in one ear while on a normal diet of food and pure water. The rabbit was offered only 12% ethanol to drink after the first ear was completely healed. A second hole was punched in the contralateral (other) ear and its regeneration (closure) rate was recorded while the animal consumed ethanol from its water bottle. Blastema biopsies from water and ethanol fed rabbits were collected at various times during regeneration and histological comparisons were made. Minor cytological changes were observed between the water-fed and the ethanol-fed animals. Minor growth retardation and edema were noted in the ethanolic blastemata.

(173)

Tissue Specificity in Endometrial Grafts to Rabbit Ears

Joseph C. Daniel, Jr. and Amin A. El-Banna

University of Tennessee

Endometrial tissue was scraped from the lining of the rabbit uterus, cut into small pieces and in a PBS carrier injected under the skin on the dorsal surface of the ear of the same animal. This type of "endometriosis" grows under the influence of progesterone whether administered exogenously or as produced during the normal luteal phase of pregnancy or pseudopregnancy. The growth rate is suppressed in estrus rabbits and in castrates given estrogen supplementation. In microscopic sections the endometrial explant reflects normal histological structure and is frequently seen to have a lumen which is filled with fluid *in vivo*. Analysis of the fluid reveals the presence of some of the same kinds of proteins found in progestational uteri. In morphology and physiological response to steroid hormones this endometrial tissue in the ear reflects the structure and function of normal uterine epithelium. Attempts to grow embryos in the lumina of these endometrial grafts will be discussed.

(174)

Ultrastructural Analysis of Protein Absorption in the Shark Yolk-sac Placenta

W. C. Hamlett, J. S. Hudson,
and J. P. Wourms

Clemson University

During ontogeny of the viviparous sandbar shark, *C. plumbeus*, its yolk sac differentiates into a yolk-sac placenta that persists to term. This functions in the

exchange of metabolites between mother and fetus. The placental unit consists of: 1) an umbilical stalk sparsely covered with ciliated squamous epithelium, containing a vitelline artery, vein and ciliated vitello-intestinal duct, continuous with the fetal duodenum; 2) a smooth, proximal portion of three layers. The outermost cuboidal epithelium possesses microvilli and lipid droplets. Beneath is a dense network of collagen fibrils. The innermost flattened layer is mesothelial-like with numerous pinocytotic vesicles; 3) a distal, rugose portion, the columnar epithelium of which has an extensive membranous transport system. It rests on a thin connective tissue stroma richly endowed with capillaries. Proximally, cells of a flattened epithelial sheet are filled with flocculent, amorphous material; 4) the egg membrane intervenes between fetal and maternal tissues. Exchange of materials is effected through this structure which persists until parturition; 5) the maternal portion consists of a densely packed vascular network overlaid by squamous epithelium. *In vitro* exposure of full term placenta to trypan blue results in intense staining of the distal portion, indicative of pinocytosis. There is little staining in the smooth, proximal portion or umbilical stalk. Ultrastructural studies using horseradish peroxidase (HRP) as a tracer of protein absorption indicate that HRP first enters a subapical system of microvesicles. These are confluent with an extensive system of smooth-walled membranous anastomosing canaliculi. These, in turn, communicate with microtubule-associated alveoli adjacent to basal vitelline capillaries. This endothelium displays pinocytotic activity on both its basal and luminal surfaces.

(175)

Application of Acridine Orange as a Vital Fluorochrome During Dormancy Release and Development from Gemmules in *Spongilla lacustris* L. (Porifera: Spongillidae)

Frederick W. Harrison

Western Carolina University

Spongillids asexually produce dormant gemmules. After release from dormancy, yolk-laden, binucleate thesocytes differentiate into histoblasts or archeocytes which form the mature sponge. Following temperature-activated dormancy release, gemmules germinated and were harvested at 12 hour intervals through 120 hours. Ruptured gemmules (0-24 hours) or sponge outgrowths were placed into Acridine Orange, 10^{-4} M, in citric acid-phosphate buffer, pH 7. Preparations, vitally stained to differentiate between DNA and RNA, were examined using incident fluorescence microscopy. Histoblasts emerged first from the gemmule (36 hours), formed a basal pinacoderm, synthesized a collagenous attachment layer, and then degenerated. Extension of the pinacoderm (48+ hours) involved mononucleate thesocyte/archeocyte over-migration, a pulse of collagen synthesis, and attachment. Flagellated chambers developed (72 hours) from single cells by enlargement of a central vacuole, sequential mitoses, and collar and flagella growth. Morphologically typical archeocytes, lacking vitelline platelets, were seen at 96 hours.

(176)

Morphological Patterns During Early Stages of Reduction Body Formation in *Spongilla lacustris* L. (Porifera; Spongillidae)

Frederick W. Harrison and Doris A. Davis
Western Carolina University

Freshwater sponges may regress in periods of temporary environmental stress and form reduction bodies. Specimens of *Spongilla lacustris*, hatched from gemmules, were laboratory-reared for two weeks before transfer into either tap water or swimming pool water to initiate reduction. Specimens were fixed in cold ethanol-acetic acid (3:1) at 0, 1, 6, 12, 24, 48, and 72 hours to allow examination of early stages of the degenerative process. Sponges, either paraffin-embedded sections or outgrowths attached to cover slips, were examined with a variety of absorption and fluorescent cytochemical techniques. Four general trends were evident during the first 72 hours leading toward reduction body formation: withdrawal of sponges into a central rounded mass; increase in lysosomal activity; cellular degeneration and reduction in number of cell types; initiation of extensive connective tissue elaboration.

(177)

A Pattern Duplication on Wings of *Drosophila melanogaster*

D. B. Benner

East Tennessee State University

Cubitus interruptus-Wallace affects the cubital wing vein, but in addition it has effects on the legs, antennae, eyes and body bristles. This paper describes wings which have a small duplicate wing blade arising from the proximal radial vein and the auxiliary vein. The other wings show enlargement of the proximal radial vein or the auxiliary vein which form the base of the duplicate wing blade. This pattern duplication of proximal structures is confined to the proximal anterior compartment and appears to localize a subcompartment within this compartment. Duplications require mitotic activity, so these results suggest that *ci^{II}* acts to increase mitotic activity, and that its effect is limited to a small area of the wing.

(178)

Cartilage Regeneration in Partially Denervated Newts

Margaret W. Egar,¹ Janet McCredie,²
and Marcus Singer¹

Case Western Reserve University¹ and
University of Sydney²

The regeneration of salamander limbs has been shown to depend upon the presence of nerves at the amputation site except in the aneurogenic larvae where limb buds have developed in the absence of nerves. This nerve dependence or the neurotrophic

effect may relate specific tissues to specific nerves or may be a quantitative effect as described in the threshold hypothesis. The adult newt arm is supplied by nerves 3, 4 and 5 and contains 21 skeletal elements distal to the humerus. Amputation of both arms at the mid-humeral level was accompanied by operation on the left brachial nerves just distal to the plexus to sever either nerve 3 or 4. In order to maintain the nerve subtraction, repeated weekly operations were required. The results showed the following percentages of cartilage regeneration: controls = 86%, nerve 3 subtracted group = 76% and nerve 4 subtracted group = 62%.

(179)

Evolution of Cryptogonochorism in Commensal Bivalves (Mollusca)

Charles E. Jenner and Thomas H. Fox

University of North Carolina at Chapel Hill and
North Georgia College

Montacuta percompressa, although belonging to a family which is basically hermaphroditic (Montacutidae), shows extreme sexual dimorphism, the males being reduced to nothing more than testes embedded in the tissue of the females. The phenomenon of having males so greatly reduced is called cryptogonochorism and is known elsewhere only in certain parasitic species of snails, copepods, and barnacles. From our studies on other commensal bivalves of the Montacutidae, and from studies reported in the literature, the evolutionary steps leading from hermaphroditism to the gonochorism found in *Montacuta percompressa* can be reconstructed convincingly.

(180)

A Characterization of a Fresh-water Mussel (Bivalvia: Unionidae) Bed in a River in South Central Louisiana

Malcolm F. Vidrine and Darryl R. Clark

Jefferson Davis Parish Mosquito Abatement
District Number 1 and University of
Southwestern Louisiana

The Calcasieu River is moderately large (approximately 50 to 100 meters in diameter) and is characterized by a shifting sand bottom. Mussel beds (aggregations) occur along the banks of the river; one such bed was analyzed in order to characterize the nature of the diversity (species composition) and relative abundance of the mollusks present. A 28 m² area was sampled, and the introduced Asian bivalve, *Corbicula fluminea* (Müller) (Corbiculidae), was the most common mollusk. Twenty-one endemic fresh-water mussel species occur in this bed. The more common mussels include *Anblema plicata* (Say), *A. dombeyana* (Valenciennes), *Tritogonia verrucosa* (Rafinesque), *Villosa lienosa* (Conrad), *Lampsilis hydiana* (Lea), *Fusconaia lanauensis* (Frierson), *Obovaria castanea* (Lea), *Lampsilis satura* (Lea), *Unio merus tetralasmus* (Say), *L. teres* (Rafinesque), *Leptodea fragilis* (Raf.), and *Quadrula pustulosa* (Lea). The viviparid snail, *Campelema decisum* (Say), was also common.

(181)

Influences of Environmental Factors on the Adult Behavior of *Ladonna deplanata* (Odonata: Libellulidae)

R. Michael McClung and Paul E. Lutz

University of North Carolina at Greensboro

A populations of adults of *Ladonna deplanata* was studied during April and May 1980, at a small pond in Greensboro, North Carolina. The purposes of this study were to assess the effects of selected environmental parameters on various facets of the behavior of these insects. Reproductive and non-reproductive activities and intraspecific interactions were observed as affected by time of day, temperature, light intensity, and cloud cover. Maximal reproductive activity was observed during mid-day, at light intensities of about 5000 ft-c, and at temperatures of 18–20°C. Although males of *L. deplanata* are considered as "perchers," non-reproductive activities frequently involved patrolling of selected territories. Peaks of non-reproductive activity by males occurred at somewhat different environmental conditions than those for reproduction. Intraspecific interactions of males consisted of aggressive threats and physical contacts. Threats were always more numerous than contacts, and their frequencies appeared to be controlled mostly by ambient temperatures and population densities.

(182)

Probable Extinction of Two Species of Flatworms in Northern Virginia

C. Kenneth Dodd, Jr.

U.S. Fish and Wildlife Service

Sphalloplana subtilis and *S. holsingeri* were described in 1977 from a single brick-lined spring in Fairfax County, Virginia. Both were highly specialized, phreatobitic species whose nearest relatives typically occur in caves farther west in the Appalachians and Interior Low Plateaus; both were recommended for endangered status at the Symposium on Endangered and Threatened Plants and Animals of Virginia because of threat of urban development. In late 1978, personnel of the U.S. Fish and Wildlife Service visited the site and began discussions with the developer in hopes of preserving the well. These talks proved fruitless and, in early 1979, an emergency rule to list these species as Federally endangered was prepared by the Office of Endangered Species. The Director of the Service never signed the rule. Construction began in late 1979 and the well site was bulldozed. Since the only known locality of these species has now been destroyed, these planarians may be extinct.

(183)

In Defense of the Harem: Intraspecific Aggression by Male Water Mites (Acarina: Unionicolidae)

Ronald V. Dimock, Jr.

Wake Forest University

Unionicolid water mites commonly occur as symbionts of freshwater mussels. In the southeastern U.S.

essentially 100% of the mussel *Anodonta imbecilis* >35 mm harbor the symbiotic mite *Unionicola formosa*. Sex ratios of adult mites vary from 1:1 to at least 1:80 (male:female) within a mussel. This variation is a consequence of a positive correlation between length of a host mussel and the density of female mites and the lack of such a correlation with males. Male mites are uniformly distributed at one per mussel, irrespective of host size. Increasing the density of male mites within a host mussel is followed by a rapid return to the usual configuration of a single male per mussel. In vitro studies reveal that while pairs of female mites and male/female pairs survive indefinitely, the pairing of males consistently results in the death of one. Intraspecific aggression among the males probably accounts for the observed distribution of this mite.

(184)

A Comparison of the Acarine Subgenera *Neoatax* and *Polyatax* (Unionicolidae: Unionicolinae: *Unionicola*)

Malcolm F. Vidrine

Jefferson Davis Parish Mosquito Abatement District Number 1

The water-mite subgenus *Neoatax* Lundblad 1941 contains seven species that oviposit in the mantle and foot tissues of fresh-water mussels (Mollusca: Bivalvia: Unionidae) in North America. The water-mite subgenus *Polyatax* Viets 1933 contains two groups, *Unionicola serrata* (Wolcott 1898) that infests the labial palp region of Nearctic fresh-water mussels and six other species that infest various snails (Gastropoda: Ampullariidae and Viviparidae) in North and South America and Asia. The members of both subgenera bear many morphological similarities, and the discovery of several new species further obscures the nature of relationship of these subgenera because the new taxa are intermediate in morphology. These two subgenera may be consubgeneric, and the true evolutionary history of these mites may be more readily explained by an evaluation of the zoogeography and host preferences rather than morphological comparisons.

(185)

Chronic Effects of Simazine on *Daphnia pulex*

Karen M. Fitzmayer,¹ Michael J. Van Den Ayale,¹ and James G. Geiger²

Tennessee Technological University¹ and U.S. Fish and Wildlife Service²

Chronic effects of simazine, an S-triazine herbicide, to the cladoceran, *Daphnia pulex*, were evaluated under laboratory conditions. Neonate *Daphnia* were exposed to sublethal concentrations corresponding to the previously calculated 48-h LC-5 (4.0 mg/l) and LC-20 (20.0 mg/l) values, and seven biological effects were measured daily for 26 days. Growth and survival were reduced significantly and reproductive maturation was inhibited at the LC-20 concentration. The LC-5 concentration had its greatest effect on the numbers of live young and broods produced; reproductive maturation was delayed by approximately one molt cycle (3 days). The number of live young produced (mean

± standard deviation) per adult *Daphnia* in the LC-5 concentration was 1.0 ± 1.1 with 1–2 broods produced per organism. The number of live young produced per adult *Daphnia* in the control group was 8.3 ± 5.1 with 5–7 broods produced per organism.

(186)

Current Status of Freshwater Zooplankton Taxonomy and Distribution in the Philippines

Augustus Mamaril

Mississippi State University

Water samples were collected by standard plankton nets from shallow-water freshwater habitats in the Philippines, including the littoral areas in the major lakes, from July 1967 until February 1980. One hundred and twenty-eight species of zooplankton are reported, representing 63 species of Rotifera, 50 of Cladocera belonging to 6 families, and 15 species of Copepoda under Cyclopoida, Calanoida, and Harpacticoida. *Indialona macronyx* (Cladocera, Chydoridae) is considered to be a separate genus, based on the presence of three head pores and longitudinal striations in its head shield and its unusually long basal spine. The Calanoida includes two endemic species, *Tropodiatomus gigantoviger* and *Filipinodiatomus insulanus* (Wright, 1928) n.g. Philippine zooplankton show similarities with southeast Asian species.

(187)

Three Species of *Lagenophrys* (Ciliophora, Peritrichida) Symbiotic on North American Crayfish

John C. Clamp

North Carolina State Museum of Natural History
and North Carolina State University

Excepting one species, peritrichs in the genus *Lagenophrys* are obligate ectocommensals of crustaceans. These ciliates are common on Australian parastacid crayfish. However, only *L. singularis*, which also occurs on snails and plants, and a species similar to *L. vaginicola* have been reported from crayfish in the northern hemisphere, although *Lagenophrys* species are common on other types of crustaceans here. Recently, three undescribed *Lagenophrys* species were discovered on North American astacid and cambarid crayfish. One species occurs on the body and gill surfaces of *Pacifastacus leniusculus* in Oregon and Washington. Two species were found on *Orconectes illinoensis* in eastern Missouri and *Cambarus bartonii* and *C. chasmodactylus* in North Carolina. Of these two, one is restricted to the host's branchial chamber, the other to body surfaces outside the branchial chamber. An additional *Lagenophrys* species was discovered on several species of entocytherid ostracods but never on the ostracod's crayfish host.

(188)

Light Dependence of *Myriophyllum* *spicatum* L. Seed Germination

P. A. Collier and L. W. Jones

University of Tennessee

Germination of *Myriophyllum spicatum* L. (Eurasian watermilfoil) mericarps is a light requiring process. The germination frequency is dependent upon, and varies directly with, the light intensity in which the mericarps are imbibed and held. The photochemical reciprocity law does not hold for the process since the effectiveness of the light energy is dependent upon the length of time over which it is absorbed. The active wavelength seems to be in the red region of the spectrum. The intensity requirement is low; consequently, under natural conditions seeds should encounter light of sufficient intensity for germination to occur. The observed lack of germination in nature must be explained by the actual wavelengths of light encountered or other inhibitory mechanisms.

(189)

A New Micro-method for the Extraction and Assay of Plant Serotonin (5-Hydroxytryptamine)

John D. Reynolds, Bruce Weekly,
and T. D. Kimbrough

Virginia Commonwealth University

A column was constructed from a 5 ml Pyrex pipette packed with Sephadex G-25. Void volume was determined using Dextran Blue dye as a marker and measuring the column eluent. The plant sample was macerated (1 ml 0.1 N HCl:1 g plant) in a glass tissue grinder. The extract was centrifuged and 1 ml of supernatant was added to the column and allowed to penetrate the gel before adding 0.1 N HCl to the top of the column. After collecting the void volume, the eluent was collected 2 drops per 18 tubes. To each tube was added 0.3 ml of OPT standard (4 mg OPT/100 ml 12.4 N HCl) and then incubated at 40°C for one hour in the dark. After removal the tubes were placed in ice to slow down sample degradation. The contents of each tube was examined spectrophotometrically (excitation—360 mu, emission—480 mu) to determine which fraction contained the serotonin. Future examinations were limited to those fractions. Serotonin standards were run both from the column and externally. Advantages of this technique are its rapidity, accuracy and economy.

(190)

Structure and Distribution of the Secretion Glands of *Grindelia squarrosa* (Asteraceae)

Michael T. Zeckmeister

University of Wisconsin, Stevens Point

An investigation of the distribution and morphology of the secretion glands of tarweed, *Grindelia squarrosa*, was carried out at the light microscope level. The secretory structures are located on the involucre bracts of the inflorescence, adaxial and abaxial leaf surfaces and leaf margins, with the greatest concentration on the teeth tips. The secretory glands are

sunken into the plant epidermis forming a depression around the bulbous gland. The gland itself is composed of 25–60 individual cells, glands seem to be associated with vascular tissue. These secretory structures produce an extremely resinous substance which gives rise to the common name of the plant.

(191)

A Developmental Study of Secretory Trichomes of *Comptonia asplenifolia*

L. Aiton (Myricaceae)

John M. Bell

University of Wisconsin–Stevens Point

The capitate-stalked trichomes of the glandular secretory system in *Comptonia asplenifolia* are lipophilic. The oil secreting trichomes develop on stipules and leaf lamina. Gland initiation begins as a vertical enlargement of an epidermal initial which then divides periclinally. Subsequent divisions form a 3 to 4 celled stalk, the terminal cell of which divides laterally. The secretory portion is delimited late in trichome development and will be followed by additional divisions into a multicellular head. Gland activity commences with the production and extrusion of a secretory product resulting in formation of a secretory cavity. The secretory cavity is formed by separation of the cuticle from the secretory cells. Abundant glandular secretion often results in the rupture of the cuticle and the release of the oil onto the leaf surface.

(192)

Biochemistry of Host Recognition by *Agalinis purpurea*

John C. Steffens, David G. Lynn,
and J. L. Riopel

University of Virginia

The first event of host recognition by the parasitic plant *Agalinis purpurea* is characterized by the development of haustoria. Haustorial formation occurs in response to exudates of a wide variety of host plants. We have carried out analyses of exudates using rapid, small-scale isolation techniques and report the first purification and characterization of naturally occurring compounds which elicit the host recognition response from *Agalinis purpurea*.

(193)

Developmental Anatomy of Adventitious Root Primordium Initiation in *Pinus banksiana* Seedling Cuttings

Cheryl R. Montain

University of Wisconsin–Stevens Point

Ninety-seven day old Jack pine seedlings were severed below the primary needles and propagated in a greenhouse mist bench. Collections were made from day 0 to day 27 and root initiation and development studied. On day 21, the first roots were visible. Before root initiation occurs callus forms at the base of the cutting. A vascular cambium continuous with the cambium of the original stem forms within the callus. The vascular cambium produces secondary tracheary elements which differ from the original cylinder by consisting of greatly shortened and heavily pitted tra-

cheids. Areas of shortened, spirally thickened, and irregularly oriented tracheids (tracheid nests) are found outside the major vascular tissue of the callus. Adventitious roots often develop near the tracheid nests.

(194)

Organogenesis of Scotch Pine by Tissue Culture

F. H. Huang

University of Arkansas

Scotch pine seeds of lowland strain were used in this study. Explants were excised from cotyledons, hypocotyl and radicle of seeds just germinated in aseptic media. Size of the explants were two mm.

Modified MS media with three level NAA (0 mg, 1 mg, and 2 mg/liter) were used as media for rooting. The photo periods were set for 12 hours daytimes and 12 hours nighttimes at the constant temperature of 27°C days and nights. The light intensities were 529 red, 70 far red and 517 blue microwatts/cm² respectively. After two months, explants from the lower cotyledons in the modified MS media of 1 mg NAA/liter showed rooting. Root caps, root hairs and primary meristems were visible under a high power microscope. Rooted explants were transferred into diluted plant hormones with filter papers set on the top of media as a bridge. After four weeks, vigorous adventitious shoot or root were observed.

(195)

Changes in DNA and Other Constituents of the Aging *Zea* Leaf

Joseph B. Harris,¹ Verlyn G. Schaefer,²
and Jerome P. Miksche²

University of Wisconsin–Stevens Point¹ and
N.C. State University²

Corn grown in the N.C. State University phytotron was sampled at upper and lower stalk positions before tassels emerged. After pollen shed had begun, the lower leaves were sampled a second time. Thus young, mature and old leaves were represented. Leaf area, dry weight, chlorophyll and protein levels were measured as indicators of stage in leaf development. Cytophotometric measurements of nuclear DNA (Feulgen) showed that significant declines occurred during aging. Both DNA buoyant density and melt data showed that shifts in the G + C percentage accompanied leaf senescence. Studies of rates of reassociation were less conclusive in indicating changes in DNA quality during mid and late leaf ontogeny.

(196)

Comparative Analysis of Seed Protein Profiles from Five Populations of *Crotalaria sagittalis* L. (Leguminosae) Using Isoelectric Focusing

Sue E. Tryba, John H. Yopp,
and Robert A. Young

Southern Illinois University

Crotalaria sagittalis is a widely distributed legume species in the eastern half of the United States and in

Mexico. Previous studies indicate that populations from different geographic locations exhibit morphological variation when grown under uniform conditions. To ascertain whether biochemical differences might also accompany morphological diversity, seed protein profiles from five latitudinally diverse populations were compared. Protein extracts from ground seed material were obtained using ammonium sulfate fractionation. Dialyzed and buffered extracts were electro-focused utilizing 1400 V, 20 mA and 8 W for one hour on 5% polyacrylamide gel plates with a pH gradient of 3.5–9.5. Qualitative and quantitative differences were noted among the protein profiles of the five populations. Most proteins were acidic with pI values from 6.5–9.0. Protein profiles among the five populations exhibited differences in total number of protein fractions and amounts of protein per fraction. Individual protein components comprised from less than 1% to 41% of the total protein in any one sample. The relationship of seed protein profile to ecophysiological differences will be discussed.

(197)

Studies of the Morphogenesis of Gametophytes of the Moss *Polytrichum commune*

Sandra T. Bowden

Agnes Scott College

Spore germination, heterotrichous protonemal growth, and gametophore initiation have been studied *in vitro* in *Polytrichum commune*. These aspects of the growth and development of the juvenile phase of the gametophyte generation have provided excellent material for studies of cytological, morphological, and physiological aspects of morphogenesis in cytokinin-treated and in untreated cultures. Exogenously supplied cytokinins have significant effects on protonemal growth, bud initiation, and gametophore development. The effects include a many-fold increase in the numbers of buds initiated by treated protonemata, a significant advancement of the time of bud initiation, inhibition of branch filament initiation, and a concentration-dependent inhibitory effect on subsequent bud development.

(198)

The Effects of Certain Growth Retardant Chemicals on Chlorophyll Levels of Tomatoes and Soybeans

F. R. Toman and Miguel Sandoval

Western Kentucky University

The literature reports both increases and decreases in chlorophyll content of plants treated with cycocel. Other reports indicate only darker and lighter leaves after treatment. In this study we determined the chlorophyll a, b, total and a/b ratios in tomato (*Lycopersicon esculentum* Mill.) and soybean (*Glycine max* L.) leaves treated with cycocel and B-Nine. Cycocel treatment increased the chlorophyll a, b, and total content in both tomato and soybeans. The ratios of chlorophyll a to b were decreased in tomato with cycocel treatment, which indicated that chlorophyll b was increased proportionately more than chlorophyll a. In soybeans however, a/b ratios were increased with cy-

cocel treatments indicating chlorophyll a was increased proportionately more than chlorophyll b. B-Nine treatments decreased the chlorophyll a, b, and total content in both tomato and soybeans. These decreases were less pronounced than the increases produced with cycocel treatments. The a/b ratios were decreased in both tomato and soybean plants when treated with B-Nine. This indicated chlorophyll a was decreased proportionately more than chlorophyll b.

(199)

Investigation of IAA and Other Indolic Compounds in Green Algae (Chlorophyta)

Robert O. Creek

Eastern Kentucky University

Auxins have been reportedly found in various species of algae with the larger marine forms being the primary ones investigated. This study was undertaken to determine whether selected species of freshwater green algae produces any IAA or other indolic compounds during their growth. Preliminary studies, using bioassay, chromatography and GLC, have indicated the presence of auxin-like substances. The results of these and continuing studies will be discussed.

(200)

Lead Uptake and Translocation in *Ailanthus altissima* (Simaroubaceae) Seedlings

W. P. Cropper, Jr. and H. L. Ragsdale

Emory University

As a test of lead uptake by roots and upward transport, lead solutions were applied to the sand-vermiculite substrates of ailanthus seedlings growing under controlled environmental conditions. Lead increased from a baseline concentration of about 1.5 ppm to 1100 ppm in roots, 66 ppm in stems, and 25 ppm in leaflets after nine weeks treatment with 25,000 micrograms of lead per week. There was no evidence of lead-induced growth impairment in the treated seedlings. Root lead accumulation increased at rates up to one percent of the total applied lead dose during a three week period. Stems and leaflets never accumulated more than 0.1 percent of the total applied lead. The proportion of lead in the above-ground tissues did not increase over time. Lead response to increasing dose was linear in the sense that the 25 ml treatment had 2.5 times as much lead accumulation as the 10 ml treatment.

(201)

Endangered and Threatened Vascular Plants of the Francis Marion National Forest, South Carolina: Part I

Richard D. Porcher

The Citadel

The Francis Marion National Forest comprises about 250,000 acres in coastal South Carolina. During 1978–80, I made a study to determine which of 59 taxa of vascular plants proposed for endangered or threatened status in S.C. occurred on the Forest. The study list was obtained from the Smithsonian Institution's *Report on Endangered and Threatened Plant Species*

of the U. S. and the Smithsonian and World Wildlife Fund's *Endangered and Threatened Plants of the U. S.* Based on a literature search, field surveys, herbaria searches, and consultations with botanists, four categories were established: (a) taxa documented for the Forest; (b) taxa not documented, but likely to occur; (c) coastal taxa with a remote possibility of occurring; and (d) taxa highly unlikely to occur.

Part I will deal with the criteria for establishing the four categories and recommendations to the Forest Service concerning the taxa in categories *b*, *c*, and *d*. Part II will deal with category *a* and discuss management recommendations and habitat preferences for these taxa. *Supported by USDA-Forest Service.*

(202)

Endangered and Threatened Vascular Plants of the Francis Marion National Forest, South Carolina: Part II

Richard D. Porcher

The Citadel

Thirteen taxa of proposed threatened vascular plants were documented for the Francis Marion National Forest. *Fothergilla gardenii*, *Sarracenia rubra*, and *Habenaria flava* were common, findings that support the conclusions of others that these taxa should be removed from threatened status consideration. *Litsea aestivalis* was locally abundant in two areas of the Forest. *Asplenium heteroresiliens* was restricted to a limestone outcrop, *Sageretia minutiflora* was found on a coastal shell mound, and *Agrimonia incisa* was found once in a disturbed maritime forest. *Pieris phillyreifolia* was found growing under the bark of *Taxodium ascendens*, and *Myriophyllum laxum* was collected from two limestone sinks. Five sites for *Schwalbea americana* were found: four in dry, sandy longleaf pine stands, and one in a longleaf pine savannah. Five sites for *Lindera melissaefolium* were found, considerably increasing the habitat information on this rare shrub. Herbarium records report one site for *Carex chapmanii*. *Supported by USDA-Forest Service.*

(203)

The Vascular Flora of the Proposed Basin of The Richard B. Russell Lake

John E. Fairey, III, Caroline C. Douglass,
and Walter C. Credle

Clemson University

On the remaining 30 mile stretch of the upper Savannah River between Hartwell Dam and Clark Hill Lake, the U.S. Army Corps of Engineers is constructing The Richard B. Russell Dam and Reservoir, which will form an impoundment of 26,650 acres in Georgia and South Carolina. The area encompasses a series of distinct habitats including lowland and xeric upland forests, sandy or rocky shoals, and river bluffs, all supporting a unique flora. A floristic survey of the area has been conducted over the past three years. Over 140 collection sites have been visited on a seasonal basis producing an inventory of over 500 species. Plants with primarily mountain affinities and those with coastal affinities have been identified such as *Aruncus dioicus* (L.) Maxim. and *Tsuga canadensis*

(L.) Carr., and *Taxodium distichum* (L.) Rich. and *Sabal minor* (Jacq.) Pers. Rare and unusual species include *Lithospermum tuberosum* Regel ex DC., *Colinsonia verticillata* Baldw. ex Ell., *Panax quinquefolium* L., *Pachysandra procumbens* Michx. and *Trilium discolor* Wray.

(204)

New Records for *Nymphaea* Taxa in Tropical and Subtropical America

John H. Wiersema

University of Alabama

Field and herbarium studies of tropical American *Nymphaea* have uncovered several interesting distributional records. Among these are the recent discovery of *N. lotus* (L.) Willd., a native of the Old World tropics, flourishing in a South Florida canal. Previously misidentified herbarium specimens indicate this species has been present in Panama for at least forty years. Equally surprising is the existence of several formerly misidentified specimens of *N. odorata* Aiton from South and Central America, adding to the known range of this mostly temperate species. Recent reports of other tropical *Nymphaea* in Florida, including *N. ampla* (Salisbury) DC., *N. blanda* G. F. W. Meyer, and *N. jamesoniana* Planchon, will also be discussed.

(205)

Azolla filiculoides Lamarck, New to the Southeastern United States

Vernon M. Bates, Jr. and Edward T. Browne, Jr.

Memphis State University

It is generally thought that *Azolla caroliniana* Willdenow is the only species of *Azolla* found in the southeastern United States. A recent examination of herbarium specimens of *Azolla* revealed megasporocarps from the coast of Georgia. Comparison of scanning electron micrographs from this locality and several localities in California confirms this collection to be *Azolla filiculoides* Lamarck.

(206)

Waldsteinia lobata (Baldw.) T. & G. (Rosaceae) Verified for South Carolina

Caroline C. Douglass

Clemson University

The range of *Waldsteinia lobata* (Baldw.) T. & G., Piedmont Barren Strawberry, has been given as Georgia, South Carolina and North Carolina by many authors. Recent investigation could confirm no records for North Carolina. Although the Smithsonian Institution listed *W. lobata* as threatened in Georgia and South Carolina, this species was deleted from a 1979 compilation of endangered and threatened plants in South Carolina because there were no substantiated reports for that state. However, in 1979, *W. lobata* was found in three locations in Oconee County, South Carolina. These sites occur on terraces, and adjacent slopes, along watercourses and are characterized by stands of *Kalmia latifolia* and *Rhododendron minus*. Preliminary conclusions might be drawn that the high, steep slopes observed at each location afford *W. lobata*

ta with specific habitat requirements, such as shading and high humidity.

(207)

Rarity: The Case for Vascular Plants at Great Smoky Mountains National Park

Peter S. White

National Park Service

What is rarity? In a practical sense, botanists have been attempting to answer this question as they assess national and regional floras to identify species that are significantly rare and hence in danger of extinction or extirpation. Some ten percent of the native vascular plants of Great Smoky Mountains National Park are considered rare, either nationally or on state levels. An additional group of plants are locally rare, although common beyond the park's boundaries. This paper seeks to distinguish kinds of rarity, to explore why some plants are rare, and to evaluate prevalent ideas about rare species using the Southern Appalachian flora for examples. It is concluded that several kinds of rarity exist and that many species become rare due to historic events and climatic change rather than because of highly specific ecological relationships. The truly rare plants of the park are distinguished from those of less concern.

(208)

The Vascular Plant Flora of Amnicola Marsh

Gene S. Van Horn

University of Tennessee at Chattanooga

Amnicola Marsh, in Chattanooga, is one of two well-developed freshwater marshes in eastern Tennessee. Over sixty species of vascular plants have been found in the few hundred square meters around the open water. The primary species nearest the open water are *Hydrolea quadrivalis* and *Polygonum cocineum*. Other taxa in or very close to the open water are *Spirodela*, *Typha*, *Rhynchospora*, *Cyperus*, and several species of both *Carex* and *Juncus*. Farther away from the open water are various grasses, *Hibiscus moscheutos*, and several taxa of young trees in the drier areas.

(209)

Floristics of the North Central Mississippian Plateau in Kentucky

Raymond Cranfill

University of Michigan

Located to the south of the Ohio River is a small disenfranchised portion of the Mississippian Plateau, a physiographic province best developed in the south central portion of the state. The region is roughly circular with Elizabethtown near the center, has an area of about 4400 km², and can be divided into three sections: Muldraugh's Hill and adjacent Salt River lowlands, the Karst Plateau, and the Dripping Springs Escarpment. The region is floristically diverse with about 1100 species, over half of Kentucky's documented flora. Analysis of the flora and vegetation points out some interesting phytogeographic problems

and refutes the highly popular notion that tall grass prairie once existed in this portion of Kentucky.

(210)

The Responsibilities of Plant Systematists in the 1980's

Samuel B. Jones, Jr.

University of Georgia

As plant systematists, we often fail to emphasize the significant research arising from our collections and we neglect the public relations required to ensure continued support. Increasingly, University funds will become reduced due to inflation and declining academic enrollments. Faced with such crises University administrators will support new programs, and discard the old. To justify our activities and our collections, we must (1) assertively increase our visibility on campus; (2) encourage the use of our collections—including providing plant material for others; (3) obtain research funding from N.S.F.; (4) publish in high quality journals; (5) become involved in studies of critical neotropical floras; and (6) train graduate students for the future. Most important is a positive professional stance bereft of the image of both "curator-itis," and "phyto-philately." We must avoid focusing exclusively on areas marginal to our responsibilities. Our ability to retain positions depends greatly on how our colleagues in other fields of study perceive us.

(211)

The Status of *Aster phlogifolius* Muhl. (Asteraceae)

Ronald L. Jones

Vanderbilt University

Aster phlogifolius Muhl. has frequently been treated as an Appalachian variety of *Aster patens* Ait., a wide-ranging species of the eastern United States. The results of field, herbarium, garden, and greenhouse studies of these two taxa are reported. Evidence is presented for the recognition of *Aster phlogifolius* as a distinct species. This evidence involves morphological features of the leaf, involucre, floret, and achene. Differences in habitat, flowering period, achene germination, and hardiness are also discussed.

(212)

Further Studies of Variation in *Galax* (Diapensiaceae)

Guy L. Nesom and Charles R. Werth

Memphis State University and Miami University

Previous study has shown that diploid and tetraploid races of *Galax* are largely allopatric, with diploids occupying the largest area. Nonetheless, sympatric populations of both ploidy levels occur in a narrow zone corresponding approximately to the Blue Ridge Escarpment. Small scale mapping of cytotypes within this zone (based on actual counts) indicates a definite patterning, possibly related to habitat preference, with the tetraploids generally occupying more mesic sites than diploids. Small triploid clones, presumably of hybrid origin, occur in close proximity to either diploids or tetraploids. An investigation is currently underway

to assess racial differentiation as elucidated by allozyme patterns.

(213)

Phenotypic Variability of *Carex* Section *Ovales* (Cyperaceae) in Alabama

Russell A. Meigs

University of Alabama

Many taxa of *Carex* section *Ovales* are phenotypically variable. As a result of this variability, many intermediates exist between currently accepted species. This study attempts to distinguish the species groups of *Ovales* which occur within Alabama and to identify their most stable phenotypic distinctions using numerical taxonomic methods. Both cluster and discriminant analyses were performed on specimens from regional herbaria of Alabama representatives of section *Ovales*. Measurements of sixty morphological characters were obtained with an emphasis having been placed on floral and fruit dimensions. The results of these analyses and their implication for the taxonomy of *Carex* section *Ovales* will be discussed.

(214)

Reproductive Biology of *Nestronia* *umbellula* (Santalaceae), a Threatened Southeastern Plant

T. Lawrence Mellichamp

University of North Carolina at Charlotte

Nestronia umbellula is a dioecious, rhizomatous, deciduous shrub which grows in dry pine-oak woods in the Piedmont Province from Virginia to Alabama. It gives the general appearance and behavior of a dwarf, opposite-leaved blueberry; yet, it is not very common even though its habitat seems to be. It is apparently hemi-parasitic on pines, blackberries, and other plants—but this does not explain its rarity. In studying the pollination and fruit set, we find that it has a low incidence of pollinator visitation (night-flying moths) and a relatively low fruit set, even from hand pollinations. Its dioecious habit and the fact that habitat destruction has isolated many populations, may account for the low success in cross-pollination. Competition may also contribute to producing weak links in its species biology cycle. Once established, the plants can be vegetatively successful, and they can recover from clear-cutting.

(215)

A Study of a Hybrid Population of *Sarracenia flava* × *S. purpurea* in an Upland Habitat

James F. Matthews

University of North Carolina at Charlotte

The Uwharrie Mountains in Piedmont North Carolina are part of the Slate Belt, being erosion resistant monadnocks formed from volcanic rocks and volcanically derived sedimentary rocks. The Uwharries provide an unusual upland habitat for plant species, such as a natural population of *Pinus palustris* growing on a hillside, a population of the mountain species, *Sta-*

chys nuttallii, and populations of restricted species, such as *Carduus carolinianus* and *Plantago cordata*. The latest discovery has been a series of populations of pitcher plants, growing in open areas around spring heads and small streams. One population consists of *Sarracenia flava* and *S. purpurea* with hybrids and potential backcrosses. The population was sampled and characters were selected to determine if introgression was occurring.

(216)

Distribution of Pollen Types in *Vernonia* (Compositae)

S. B. Jones, Jr. and S. C. Keeley

University of Georgia, Whitlitt College and
Natural History Museum of Los Angeles County

Vernonia is the largest genus of the tribe Vernonieae with nearly 1000 species found predominately in the New and Old World tropics. Morphological variation in vegetation features is extensive; however, floral characters are relatively uniform. This uniformity has led to difficulties in understanding relationships within *Vernonia*. Pollen morphology is distinctive however, and of taxonomic value in assessing infragenic groups. In an attempt to understand better the patterns of radiation in the genus, pollen from over 500 species of *Vernonia* was examined from throughout the geographical range by light microscopy and SEM. There are six basic types of pollen grains. The distribution of pollen types is correlated with the radiation of related species groups. A widespread, probably ancestral, pollen type is found in both the New and Old Worlds, but other types are found to be exclusive to, or to predominate in, one hemisphere. Structural changes appear to be associated with functional modifications. The pattern of pollen distribution appears to reflect the evolutionary divergence of species within the genus over time and supports a broad concept of the genus.

(217)

Extrafloral Nectaries and Plant Guarding in *Ipomoea pandurata* (L.) G. F. W. Mey. (Convolvulaceae)

Robert L. Beckmann, Jr. and Jon M. Stucky

North Carolina State University

Throughout its range in North and South Carolina, ants and wasps are attracted to the pedicellar extrafloral nectaries of *Ipomoea pandurata*. These hymenopterans are aggressive toward phytophagous insects that visit the plants. Protection of the plant is afforded by these pugnacious hymenopteran nectar feeders.

(218)

Morphological Variation in *Heteranthera dubia* (Pontederiaceae)

Charles N. Horn

University of Alabama

Study of the morphological variation in submersed forms in *Heteranthera dubia* (Jacq.) MacM. revealed that two different environments exist in which populations have distinct leaf morphologies: rivers and

lakes. Submersed river plants have been observed in the Portage River, Ottawa County, Ohio, the Shenandoah River, Warren County, Virginia, and Big Darby Creek, Madison County, Ohio, where the length to breadth (L/B) ratios for populations varied from nine to twenty. Plants in the Erie Islands area, Lake Erie, Ottawa County, Ohio, had L/B ratios varying between thirty and fifty. These two variants, the lake and river, were found to be genetically distinct, with respect to measured L/B ratios. In addition, submersed plants showed a great plasticity due to environmental conditions. Laboratory experiments revealed that a more organically rich substrate will result in a larger leaf area. A lower light intensity resulted in narrower leaves and a higher L/B ratio. This environmental variation shows that the genetic distinction found should not be taxonomically recognized.

(219)

Intraplant Variation in Two Varieties of *Sphagnum macrophyllum*

David M. Lane

University of Georgia

Two varieties of the Coastal Plain bryophyte *Sphagnum macrophyllum* Bernh. ex Brid., var. *macrophyllum* and var. *floridanum* Aust., have been recognized previously as different species, varieties, or forms based mainly on the pattern of variation in features of the leaf cells. Recently, some authors have synonymized the two taxa after observing transitions of character states within individual plants, and, occasionally, within single leaves. A quantitative survey of the intraplant variation in field material and in the critical herbarium specimens supports the recognition of the two taxa at the varietal level. However, when the observed pattern of highly correlated character states is viewed in the context of the total range of variation that has been described in the species, another interpretation is possible. All of the variation described to date may represent variation in a single complex character that varies in degree of expression with latitude.

(220)

Fate of [³H] Aminoalaevulinic Acid-Labeled Hemoglobin in *Schistosoma mansoni* Schistosomules *In Vitro*

Lewis A. Foster and Burton J. Bogitsh

Vanderbilt University

Red blood cells labeled with [³H] aminoalaevulinic acid *in vitro* were fed to *S. mansoni* schistosomules collected after skin penetration and cultured *in vitro*. Hemoglobin labeling was demonstrated by carboxymethyl cellulose chromatography. Autoradiographic techniques failed to show label within the schistosomules, yet label was detected by liquid scintillation counting of trypsin-digested schistosomules. Regurgitation of label was demonstrated by placing fed schistosomules into fresh culture medium. Characterization of the labeled regurgitant by acrylamide gel electrophoresis and paper chromatography will be discussed.

(221)

Cytochemical Observations on the Golgi Complex of *Schistosoma mansoni* (Trematoda)

B. J. Bogitsh

Vanderbilt University

The gastrodermal Golgi complexes of adult *Schistosoma mansoni* are morphologically similar to those described in secretory cells. The cisternae at the emitting (trans) face becomes progressively flattened. Membrane bound secretory granules with electron-dense contents as well as condensing vacuoles can be identified at this region. Several cytochemical markers were used in studying the polarity of the organelle. It is hypothesized that a functional bipolarity may be demonstrated by the Golgi complex under stress conditions. The forming (cis) face of the Golgi complex appears capable of packaging lysosomal enzymes while the emitting region is responsible for the packaging of the secretory granules.

(222)

Preliminary Studies of the Immune Response of *Canis* sp. to Experimental Challenges of *Trichuris vulpis* (Nematoda: Trichuridae) and Hookworm sp. (Nematoda: Ancylostomatidae)

Frederic R. Hornick

University of South Carolina

The study of the Immune response of *Canis* sp. has not been studied extensively. In the studies that have been done few have concerned the response to helminth infections. The object of this study is to obtain preliminary data concerning the Immune response of *Canis* sp. to *Trichuris vulpis* and hookworm infections. In the study the two parasite infections were given to groups of Beagle puppies. Blood samples were drawn during the course of the infection. The blood samples had various tests performed on them. These tests included Total protein, Protein electrophoresis, IgM and IgG immunodiffusion and Complete Blood counts. Initial analysis of the data shows significant changes in protein fractions and immunoglobulins in the hookworm infections but little change in response to the *Trichuris* infection. Further analysis by computer programs will be presented.

(223)

Dirofilaria immitis (Nematoda: Filarioidea) Microfilariae in the Blood of Dogs in the Absence of Adult Heartworms

Jeffrey A. Butts and Donald C. Schrum

University of North Carolina at Charlotte

During the Summer of 1978, necropsies of dogs of all sizes from the Matthews Animal Shelter in Gaston County, N.C., revealed that many dogs with circulating microfilariae in their blood prior to carbon monoxide euthanasia did not have adults of *Dirofilaria im-*

mitis in their hearts, venae cavae, or pulmonary arteries. During the Summer of 1980, 11 of 61 large and medium-sized dogs from the shelter tested prior to euthanasia were found to have circulating microfilariae. Upon necropsy, 4 (36.4%) of the microfilaria-positive dogs lacked adult *D. immitis* in their hearts or associated major blood vessels. All microfilaria-positive, adult-negative dogs had low numbers of circulating microfilariae prior to euthanasia.

(224)

Evidence for Phylogenetic Influence on Host Specificity of *Eimeria* in Interspecific Hybrid Hosts

Greg Mathis and Larry R. McDougald

University of Georgia

According to Vetterling (J. Protozool 23:76), the host specificity of some parasites is due to relative genetic proximity: close phylogenetic relatives would be more likely to support a common parasite. Since we had information from previous work on the lack of susceptibility of hybrids of chickens and guinea fowl, we decided to conduct similar work with hybrids of chickens and Japanese quail, which are purportedly more closely related (Wettmore, Smithsonian Misc. Coll. 177, 195). Chicken/quail hybrids were obtained after artificial insemination of Japanese quail hens with semen from White Leghorn cocks. The hybrid progeny were challenged with oocysts of *E. tenella*, *E. maxima* and *E. acervulina* (from the chicken) at 2 weeks of age, and with *Eimeria* sp. from the quail at 4 weeks of age. The hybrids passed oocysts of all species, but in greatly reduced numbers, in comparison with susceptible chickens and Japanese quail infected at the same time. These results seemed to support the theory of Vetterling and possibly to lend credence to Wettmore's analysis of the phylogeny of gallinaceous birds. Further studies are planned with other birds to further clarify this relationship.

(225)

Endogenous Development of the Swine Coccidium *Isospora suis* Biester 1934

David S. Lindsay

Auburn University

The endogenous development of *Isospora suis* Biester 1934 is described in piglets inoculated with 150,000 or 200,000 sporulated oocysts. Endogenous stages developed within villous epithelial cells throughout the small intestine. Two distinct types of meronts were seen in tissue sections. Type I meronts which were seen at 3 days post inoculation, were binucleate, elongate and were 10.5 by 4.7 μ m and produced 2-14 Type I merozoites per parasitophorous vacuole. Type I merozoites were 10.0 by 3.6 μ m. Type II meronts which were seen at 4 days post inoculation, were elongate and contained 3-12 nuclei. Type II meronts were 11.4 by 5.3 μ m, and 1 to 4 were found per parasitophorous vacuole. Type II merozoites were 6.3 by 2.1 μ m and 3-16 were found per parasitophorous vacuole. The peak of asexual development occurred 4 days post inoculation. Fully developed microgamonts, macrogamonts and oocysts were seen 5 days PI. The prepatent period was 5 days, and the patent period was 5-8 days. No extraintestinal stages were seen.

(226)

Giardia and Parakeets

Robert G. Scholtens and Sandra Johnson

College of Veterinary Medicine

University of Tennessee

Giardia, a parasitic flagellate of the upper intestine, has been found in numerous vertebrates. Most of these hosts were mammals but some amphibians have also been infected. There are a few reports of *Giardia* from birds, and its recognition in parakeets by an Oklahoma veterinarian stimulated our studies. We have examined 77 parakeets from 4 aviaries; 53 by repeated fecal examinations and 24 by mucosal scrapings at necropsy. At least 42 of the 53 antemortem examinations had *Giardia* cysts and/or trophozoites, and 6 of the 24 postmortem samples contained trophozoites. The infection appears to be most common in younger parakeets and in group-caged birds. Many of the infections seem to be asymptomatic, and no clear disease syndrome has yet been discerned in infected birds which are not well.

(227)

Dicheilonema rhea (Nematoda: Diptirienidae) from a Common Rhea at The Knoxville Zoological Park

Sharon Patton

College of Veterinary Medicine

University of Tennessee

In January 1979, an adult female *Rhea americana* died at the Knoxville Zoo and was necropsied at UT Veterinary College. Four nematodes, three females and one male, were found in the air sacs. Females measured 845, 947, and 1008 mm in length by 2 mm in width. The male measured 297 by 1 mm. These nematodes were identified as *Dicheilonema rhea* because they were long, slender, oviparous Spirurida from the air sacs. Also the mouth was surrounded by a raised cuticularized peribuccal ring with a pair of lateral extensions. Eggs similar to those described for *D. rhea* were in lung sections from the dead rhea and in fecal exams from two rheas at the zoo. It is not known if these birds were raised in the US or were imported from South America. The life cycle of *D. rhea* is unknown although it is assumed to have an arthropod intermediate host.

(228)

The Gastro-intestinal Helminths of Some Sea Birds From North Carolina

Ronald W. Mobley and Grover C. Miller

North Carolina State University

Eighty-five birds of the orders Procellariiformes, Pelecaniformes, and Charadriiformes were examined for gastro-intestinal helminths between May 1977 and September 1979. At least nine species of helminths were recovered, consisting of one species of digenetic trematode, at least six species of cestodes, one species of nematode, and one species of acanthocephalan. New host records are established for *Tetrabothrius laccocephalus* in the Northern Fulmar and Audubon's Shearwater; *Tetrabothrius minor* in Cory's Shearwater; *Tetrabothrius* sp. in the Red-Billed Tropicbird;

Tetrabothrius filiformis, *Choanotaenia* sp. and *Contracaecum* sp. in Wilson's Storm Petrel; and *Opisthorvarium elongatum* and *Falsificollis almani* in the Common Tern. An attempt was made to correlate incidence and prevalence of parasitism with host age, sex, and feeding habits. This project was conducted in conjunction with the North Carolina State Museum studies of the ecology of sea birds from North Carolina.

(229)

Some Ecological Observations of Delaware Forests

Richard Stalter

St. John's University

The arborescent vegetation of Delaware forests was studied in order to determine species composition and dominance. Four sites were selected in the Appalachian Piedmont Province (APP) and eight were selected in the Coastal Plain Province (CPP). Forests were chosen if they were predominantly hardwood in composition, relatively undisturbed, protected from further cutting, and at least ten acres (4.04 ha) in size. The quadrat method was used to sample arborescent vegetation. *Fagus grandifolia* and *Liriodendron tulipifera* were dominant in the APP while *Quercus alba*, *Quercus rubra*, and *Quercus velutina* were important associates. *Quercus alba* was the dominant species of mature forest in the CPP, with *Liquidambar styraciflua* and *Acer rubrum* the most common associates. *Acer rubrum* is dominant in the "Great Cypress Swamp" located in southern Delaware and adjacent Maryland. Forests in the APP were richer in arborescent species than the forests of the CPP, and more similar in species composition.

(230)

Vegetation Mapping in Tyrrell County, North Carolina

Charles B. McDonald and Andrew N. Ash

East Carolina University

Tyrrell County is located between the Albemarle and Pamlico Sounds in the tidewater region of North Carolina. Through a contract with the North Carolina Natural Heritage Program a vegetation map was developed as a first step in locating potentially significant natural areas. This paper describes mapping techniques, the types and extent of natural plant communities, and the effects of human impact on the natural vegetation in this county.

(231)

Frying Pan Gap Oak Orchard Study: Age of the Stand

James H. Horton and Garrett A. Smathers

Western Carolina University

The gnarled, widely-spaced oaks (*Quercus rubra* var. *borealis*—Fagaceae) in Frying Pan Gap (mile 409.6, elevation 1500 m, Blue Ridge Parkway) were sampled by means of eight 20 × 20 m quadrats—enough to include 100 trees. The 92 living trees esti-

mated to be over 4 cm diameter were aged by taking two increments at right angles to each other, calculating the average number of rings/cm, and applying the formula age = $\bar{x}$ rings/cm × 1/2 diameter. Age distribution is bimodal with a 30-year gap beginning about 120 years ago. These and other results and their implications will be discussed. This is the first in what is envisioned as a series of studies designed to explain the origin and maintenance of this community type.

(232)

Dispersal and Establishment of Red Spruce and Fraser Fir in the Balsam and Craggy Mountains

Joseph H. Sullivan, J. Dan Pittillo, and Garrett A. Smathers

Western Carolina University

Seed dispersal estimates utilizing 1 m square boards coated with "Tangletrap" were located at two sites, Judaculla Fields, a grass bald completely surrounded by spruce-fir forests, and Craggy Flats, a grass and heath bald. Relevé samples were taken at Judaculla Fields to determine negative associations with adjacent species. Observations indicated very few seeds were dispersed into Judaculla Fields in 1979. No negative associations were noted between spruce or fir seedlings and associated species. Resampling of the plots in spring of 1980 indicated considerable die-back of one to two year spruce and fir seedlings. No seeds were trapped in the Craggies and the study area had no established seedlings. It was concluded that adequate seed quantities were reaching the grass bald at Judaculla but their establishment was being slowed by physical factors rather than competition factors.

(233)

Vegetational Patterns of the Balsam and Great Smoky Mountains of the Southern Appalachians

J. Dan Pittillo and Garrett A. Smathers

Western Carolina University

A transect of the Balsam Mountains over the 61 km between Balsam Gap and the French Broad River was sampled at 92.5 m elevational intervals throughout the 610–1830 elevational gradient (cf. Pittillo and Smathers, Proc. Sec. Res. Conf. in the Nat. Parks, Am. Inst. Sci., in press). A total of twenty-seven 10 × 10 m relevé plots allowed sufficient sampling to give the basic vegetational description. Nine vegetational groupings varying from floodplain forest to spruce-fir forests were listed. These patterns were compared with Whittaker's classic Smoky Mountain study. Four major groupings noted for the Balsams were not mentioned by Whittaker but Whittaker included several types of oak forests not split out in the Balsam study. Overall species numbers were higher in the Balsams; three times as many species occurred in the Balsams only as in the Smokies only. Vegetational patterns of the southern Appalachians seem to be too complex to allow use of only one portion, such as the Smokies, to characterize the entire region.

(234)

Gradient Analysis of Appalachian Forest: A Review Plus Further Analysis

A. J. J. N. Campbell

University of Kentucky

From published data, there appear to be two major habitat gradients in the Appalachian forest, related to soil pH and moisture stress, though there is a loose association between acid and dry conditions. In mesic forest, the sequence of dominants between pH 4 and 6 is from *Tsuga* to *Fagus* to *Acer saccharum*; in subxeric forest, from *Quercus prinus* to *Q. alba* (to *Q. muhlenbergii*); in xeric forest, from *Pinus rigida* to *P. virginiana* to *Juniperus*. The "pH-gradient" is related to bedrock, topographic position and, less clearly, climate. The "moisture-gradient" is related to topographic position and climate. Succession generally involves shifts from "xeric" to "mesic" composition. Some reports from the northeast also indicate shifts along the "pH-gradient" within mesic late successional forest, perhaps involving acidification processes. The ordination allows some synthesis of studies of chestnut-replacement, showing the net shift from "*Q. prinus*-*Castanea*" to more "*Q. alba*-*Carya*" type of composition.

(235)

Natural Disturbance by Tree-fall Gaps in Old Growth Mixed Mesophytic Forest in Eastern Kentucky

William H. Romme and William H. Martin

Eastern Kentucky University

Lilley Cornett Woods contains one of the largest remaining tracts of virgin mixed mesophytic forest in eastern Kentucky. Although the old-growth parts have never been subjected to logging or other large-scale human disturbance, natural small-scale perturbations nevertheless are prominent features of the forest. Past disturbance is indicated by numerous soil pits and mounds created by large uprooted trees, and frequent disturbance continues with opening of the canopy by tree-falls. The rate and average gap-size of natural tree-falls are estimated from records kept of 42 gaps formed since 1973. From these data, an estimate of turnover time (time necessary for the entire forest area to be affected by tree-fall gaps) is made. Implications of this disturbance regime for the long-term structural dynamics of the virgin mixed mesophytic forest are discussed.

(236)

Forest Development in Canopy Gaps of a Diverse Hardwood Forest of the Southern Appalachian Mountains

Lawrence S. Barden

University of North Carolina at Charlotte

In a mature hardwood forest of 15 canopy species [$1/(\Sigma p^2) = 7.2$] in Great Smoky Mountains National Park, Tennessee, tree replacement in 118 single-tree gaps and 42 multiple-tree gaps was predominantly by

species which are tolerant of shading. However, four species of low shade tolerance, *Liriodendron tulipifera*, *Prunus serotina*, *Quercus rubra*, and *Fraxinus americana*, were able to hold three percent of the canopy area by infrequent capture of gap space, particularly in multiple-tree gaps. Trees of lower tolerance for shade have larger crowns than very tolerant trees. Relative crown sizes were used as weighting factors to improve predictions of a Markov chain model of canopy composition. *Tilia heterophylla* tended to replace itself by basal sprouts. *Liriodendron tulipifera* was found as a replacement tree primarily in gaps formed by the fall of *Tsuga canadensis*.

(237)

Forest History for the Last 12,000 Years at Cahaba Pond, St. Clair Co., Alabama

Hazel R. Delcourt,¹ Paul A. Delcourt,² and Allen M. Solomon¹

¹Oak Ridge National Laboratory¹ and
²University of Tennessee²

Cahaba Pond is a 0.2-ha sinkhole located at 200 metres elevation in the southernmost Ridge and Valley physiographic province of central Alabama. A 650-cm sediment core recovered from this site has a basal date of $11,960 \pm 70$ radiocarbon years before present. Pollen and plant-macrofossil sequences from this sediment core reflect changing forest composition through the present interglacial period (the Holocene) on the 5-ha watershed surrounding the site. In the early Holocene, mesic deciduous forests were dominated by beech, with hornbeam, hickory, oak, and cypress. In the mid-Holocene, beech was replaced by oak, with hard pine, white pine, birch, magnolia, hemlock, chestnut, and red maple. Oak and black gum dominated during the late Holocene. These data document biotic response to Holocene climate change in central Alabama. Research supported by National Science Foundation, Ecosystem Studies Program, under Interagency Agreement No. DEB-77-26722 with the U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation.

(238)

Sandstone Outcrop Plant Communities of the Cumberland Plateau in Tennessee and Northern Alabama: The Vascular Plant Communities

Bretta E. Perkins and Hal R. DeSelm

University of Tennessee

Six sandstone outcrops on the Cumberland Plateau were sampled from Lookout Mt., AL, north to Pickett Co., TN. Transects were established and used to sample life-form zones varying from forest to shrub-herb border to cryptogam-herb to lithophyte dominated areas. An index of similarity was calculated between study areas based on sampled taxa; all areas were about equally similar. Data were then combined from all areas for hierarchical agglomeration (cluster analysis) and reciprocal averaging ordination to group plots of each size and zone into communities; these were verified using discriminant analysis. Environ-

mental variables, as soil moisture, depth, and pH, and shade, were used to interpret the ordination axes. Three tree dominated and several shrub or herb dominated communities occurred; some of the latter crossed life-form zones.

(239)

Vegetation and Flora of Shiloh National Military Park, Tennessee

Ron L. Jones and Peter S. White

National Park Service

Shiloh National Military Park (elevation range 111–162 m) is a 1500 ha tract lying along the west bank of the Tennessee River in Hardin County, Tennessee. The gently rolling Shiloh upland is developed on river terrace materials and is dominated by oaks, hickories, red cedar, shortleaf pine, blackgum, sweetgum, winged elm, black cherry, and red maple. Creeks dissect this upland and in the often steep-sided small ravines mesophytes such as beech, sugar maple, basswood, red oak, and tuliptree dominate. Thick alluvial deposits are dominated by such species as cherry bark oak, water hickory, sweetgum, sycamore, swamp chestnut oak, boxelder and hackberry. A small area of bald cypress-water gum swamp forest is present. Basal areas range from 10–40 m²/ha. Several areas include remnant old growth forest including the Owl Creek bottomland. Trees 80–140 cm dbh can be found here. Over 600 vascular species have been documented; geographical relations of these will be discussed.

(240)

Vegetational Analysis of *Acer saccharum* (Aceraceae) Dominated Communities in Southern Illinois

Charles L. Bushey

Southern Illinois University

The study presents an analysis of selected forested communities in Southern Illinois in which *Acer saccharum* is the dominant or co-dominant overstory species. This community type is highly restricted in the five natural physiographic divisions studied in Southern Illinois. Stands were found primarily on protected north or northeast facing slopes, or alluvial terraces, and frequently at or near the base of sandstone bluffs. *Acer saccharum* dominated communities are poorly developed on sites with chert parent material. Size-class structure and stand composition of successional and undisturbed stands were analyzed to determine the effects of disturbance. *Acer saccharum* is invading many adjacent forest communities dominated by oak and hickory. The significance of this invasion is being investigated.

(241)

An Analysis of the Herbaceous Vegetation along Moisture and Temporal Gradients in a Southern Illinois Floodplain Forest

M. Louise Young

Southern Illinois University

The herbaceous vegetation in Boulder Slope Woods, an area in Little Black Slough Natural Area

in southern Illinois, was studied using indirect gradient analysis. A transect system was established to parallel a postulated moisture gradient, which begins in the upper slope and extends through lower slope and floodplain woods to the edge of the swamp. Transects were sampled six times throughout the growing season. The data were ordinated using DECORANA and coenoclines were constructed on the basis of the ordination scores. Community analysis using TWINS-SPAN (Two Way Indicator Species Analysis) identified three communities; upper slope, lower slope, and floodplain. Indicator species for each of these communities were identified for each sampling period. Tolerance to flooding is suggested as the primary sorting factor on the moisture gradient, while the life cycle of herbaceous species, including tolerance to heat, drought, and shading, is the probable sorting factor on the temporal gradient.

(242)

Behavioral Avoidance, Toxicity and Histological Changes of Rainbow Trout (*Salmo gairdneri*) Exposed to Acidic and Basic pH Conditions

**James B. Whitaker, Donald S. Cherry,
David A. Stetler, and John Cairns, Jr.**

*Virginia Polytechnic Institute and
State University*

Behavioral avoidance, toxicity and changes in gill tissue ultrastructure of fingerling rainbow trout (*Salmo gairdneri*) were evaluated under acidic and basic pH conditions. Avoidance thresholds, which were evaluated in a steep-gradient trough, were compared to 96 hr static toxicity tests with regular monitoring and pH adjustments. Fish gill tissue was analyzed by transmission electron microscopy (TEM) after selected, constant time exposures (hr vs. min) to pH 4.0 and 10.0. The first significant avoidances ($\alpha = 0.05$) occurred at pH 6.5 and 6.0 at acclimation temperatures of 12°C and 18°C, respectively, which were responses to sublethal acid concentrations (LC50_{96 hr} = 4.11). The LC50_{96 hr} response of 8.95 to basic pH exposures was only ~1.5 pH units above control acclimation levels. This greater susceptibility to basic conditions was confirmed in TEM analysis, as structural damage to gill tissue occurred rapidly (5–45 min) at pH 10.0 and more slowly (3–64 hr) at pH 4.0.

(243)

The Effects of Short-term Chlorine Exposure on Rainbow Trout (*Salmo gairdneri*) Blood Chemistry

W. Roscoe Miller, III

*Virginia Polytechnic Institute and
State University*

Twenty, two-year old, rainbow trout (*Salmo gairdneri*) were examined to determine the sublethal effects of chlorine on trout blood chemistry. The animals were divided into two groups of ten each and housed in 568 l (150 gal) aquaria. Chlorine was introduced to the exposed group by the addition of measured amounts of calcium hypochlorite, which produced a peak total residual chlorine of 0.165 mg/l. One animal from each group was sacrificed at 2.5-hour intervals

for 24 hours and blood obtained by cardiac puncture. For each sample the following parameters were measured: hematocrit, hemoglobin, RBC count, total protein, albumin, inorganic phosphorus, magnesium, LDH, SGOT, alkaline phosphatase, and glucose. Data were analyzed by comparing the slopes of each group's regression line. It was demonstrated that chlorine had a significant (0.05) effect on inorganic phosphorus, alkaline phosphatase, hematocrit, and hemoglobin. Results suggested that chlorine hemolyzed trout red blood cells.

(244)

Comparison of Growth, Population Structure and Food Habits of *Semotilus atromaculatus* (Creek Chub) in Undisturbed and Stripmining-disturbed Streams

David M. Stair, Jr., Virginia R. Tolbert,
and Gerald L. Vaughan

Science Applications Inc., Oak Ridge, Oak Ridge
National Lab., and University of Tennessee

Creek chubs were collected from one undisturbed stream and three streams disturbed by surface mining (one, three, and twenty-five years ago) to determine if differences in growth, population structure and food habits of creek chubs occur among streams. Multiple methods of data analysis were used for cross validation and to insure correct interpretation of the results. Stomach contents were determined and condition factors calculated for each individual for comparison of habitat-induced differences among streams. The growth increment for chubs in the disturbed streams was greater than for those in the undisturbed stream, probably as the result of smaller populations and resultant reduced competition in the disturbed streams. There was significantly more fat in fish in the undisturbed stream and least disturbed stream than from the two most disturbed streams. Following mining disturbance, there were no young-of-the-year chubs. Population density in the undisturbed stream was three times the densities in the disturbed streams. The amount of food in the chubs' stomachs decreased and the number of fish with empty stomachs increased with increased disturbance. The percentage of aquatic food sources in the stomachs of the chubs was greatest in the undisturbed stream and least disturbed stream. The percentage of terrestrial food consumed was greatest in chubs from the two most disturbed streams. Research sponsored by the U.S. Department of Energy under contract EY-76-S-05-4946 with the University of Tennessee and under contract W-7405-eng-26 with Union Carbide Corporation.

(245)

The Occurrence of Juvenile *Mycteroperca microlepis* (Epinephelinae) in Estuarine Waters

Susan Brown

Georgia Southern College

The gag grouper, *Mycteroperca microlepis*, is the most abundant of several species of grouper caught commercially by fishing boats in South Carolina. In

1977 most of the 176 tons of gag groupers harvested commercially in South Carolina were discarded as undesirable. However, potentially the gag grouper could become a valuable food source with a substantial market value. Although this is a very abundant species living offshore as an adult, very little is known about the life stages of this species. The present study was undertaken to determine if *Mycteroperca microlepis* inhabits the estuarine waters of South Carolina during development. Analysis of offshore and estuarine collections showed that adults and larvae are found offshore. Juveniles are found in the estuaries and appear to use this as a nursery ground. The larvae found in the estuaries were larger than any larvae captured offshore. This suggests that adult groupers spawn offshore and the larvae then migrate into the estuaries where they live as juveniles. This research was supported by the South Carolina Sea Grant Program.

(246)

Growth and Secondary Production of the Oligohaline Barnacle *Balanus subalbidus* Henry (Crustacea: Cirripedia) Settling on Hester-Dendy Artificial Fouling Plates in a Tidal Louisiana Lake Receiving a Heated Effluent

Darryl R. Clark

University of Southwestern Louisiana

There were no differences between control and thermally influenced stations in *Balanus subalbidus* Henry total percent cover, densities, or growth rates in Lake Peigneur, Louisiana. However, multiple-plate samplers placed at intermediate stations had barnacle organic weights 2.5 and 3.5 times greater than those at discharge and intake stations respectively. This may have been caused by increased nutrients carried by discharge currents or the existence of more optimal temperatures at intermediate compared to discharge or intake stations. Mean and maximum barnacle rostral-carinal diameters were 7.7 mm and 18.6 mm respectively. Cyprid larval recruitment occurred in early spring and mid-summer. The mean barnacle growth rate was 1.0 mm/mo., and the greatest growth rates (2.5 mm/mo.) were measured from late spring through early fall. Barnacle secondary production ranged from 0.26 g·m⁻²·day⁻¹ to 0.41 g·m⁻²·day⁻¹ on fouling plates submerged in July and March respectively. Barnacles comprised 50–73% of the total epifaunal secondary production.

(247)

Observations on the Trophic Ecology of the Crayfish *Orconectes neglectus chaenodactylus* (Decapoda: Astacidae)

James O. Price

Memphis State University

Food use by adult *Orconectes neglectus chaenodactylus* and food availability in the environment are compared; seasonal and diel variations in the diet and feeding behavior are examined. Although this crayfish is primarily a detritivore, strong evidence supports its

role as an opportunistic omnivore. Some selection also occurs in the diet, apparently by exploiting food items with a minimum cost/benefit ratio. Diversity in the diet increases as food abundance decreases during winter months. During May, variations in the diet may be attributed to recent floods, appearance of young, and molting. Stomach contents of recently molted crayfish contain exuvial remains, apparently reflecting conservation of nutrients rather than cannibalism. Feeding normally occurs throughout the diel cycle with peaks shortly after sunset. Feeding behavior and diet are modified in vulnerable crayfish (brooding females and molting males).

(248)

Parquat Toxicity to Freshwater Copepods and Red Crayfish (*Procambarus clarkii*) of Louisiana

Tat-Sing Leung, Nusrat Z. Naqvi,
and Syed M. Naqvi
Southern University

Static bioassay tests were conducted to determine paraquat toxicity to copepods (*Diaptomus* spp. and *Eucyclops* spp.) and Louisiana red crayfish, *Procambarus clarkii*. The LC_{50} values were determined by probit analysis done on a computer. Twenty-four and 48-hr LC_{50} values (ppm) for copepods were 10 and 5, respectively. Adult crayfishes were 7.5 times more tolerant than juveniles in 48 hr and 7.1 times in 72 hr tests. The respective 48-hr LC_{50} values (ppm) for adult and juvenile crayfishes were 39 and 5.2, and 72-hr were 17 and 2.4.

(249)

Oxygen Tension in Relation to Ambient Oxygen Tension in Five Species of Freshwater Snails (Mollusca: Gastropoda)

Robert W. Hanley,¹ Gordon R. Utsch,¹
and Frank G. Nordlie²
¹University of Alabama¹ and
²University of Florida²

The relationship between the ambient oxygen tension and the rate of oxygen consumption (VO_2) was determined in five species of freshwater snails: *Planorbella dumy* (Planorbidae), *Pomacea paludosa* (Amphipariidae), *Viviparus georgianus* (Vivipariidae), and *Goniobasis floridensis* and *G. altheae* (Pleuroceridae). Field measurements of dissolved O_2 showed that the first four species live in habitats which periodically become oxygen deficient. These species are regulators. The fifth species, *Goniobasis altheae*, inhabited only well-oxygenated waters, and is a metabolic conformer. The results of this and other studies suggest that metabolic oxygen regulation in freshwater snails has a polyphyletic origin, and evolves in response to fluctuations in ambient oxygen tension.

(250)

Investigation of a Suspended Culture of *Crassostrea virginica*

Dee Dundee and Gary Swindler
University of New Orleans

An experimental suspended culture system was designed to improve cultivation methods of *Crassostrea virginica* in Louisiana waters. Growth rates were studied for suspended cultures and conventional bottom cultures. Mortality rates were determined from the effects of predation, disease, and environmental stress. Preliminary results of the efficiency of the cultivation method and the environmental performance of the suspended system will be presented.

(251)

Seasonal Abundance of Molluscs in Two Mississippi Brackish Tidal Marshes

T. Dale Bishop and C. T. Hackney

University of Southwestern Louisiana and
University of North Carolina at Wilmington

Seasonal abundance of the molluscs of two brackish tidal marshes in St. Louis Bay, Mississippi was studied from June 1979 to May 1980. The marshes were dominated by *Juncus roemerianus* and *Spartina cynosuroides*. *Cyrenoida floridana* and *Polymesoda caroliniana* were the most common bivalves in both marshes. *Cyrenoida* densities were always greater in *Juncus* and peaked during late Spring and Summer. *Geukensia demissa granosissima* was occasionally collected from the *Juncus* marsh but not in *Spartina*. Dominant gastropods differed with marsh type. A succinea was most common in *Juncus* followed by *Detracia floridana* and *Melampus bidentatus*. All three species showed greater densities in Summer and early Fall months. The succinea was not collected in the *Spartina* marsh. A hydrobiid, *Littoridinops palustris* predominated in *Spartina* followed by *Detracia floridana* and *Vertigo ovata*, a terrestrial species. These species showed more varied seasonal densities. Seasonal densities are potentially explained by physical factors and species interactions.

(252)

Assimilation in the Estuarine Clam, *Rangia cuneata*, After Uptake of *Serratia* and *Englena*

Donald B. Jeffreys, Milbrey Cate,
Linda P. Hemingway, and Bernard E. Kane, Jr.
East Carolina University

The estuarine clam, *Rangia cuneata*, has a bacterial content significantly higher than that of commercial oysters, and this has caused problems in the marketing of this species. To determine whether bacteria are important in the nutrition of *Rangia*, assimilation of the bacterium, *Serratia liquefaciens*, was compared to assimilation in *Englena* fed clams by assaying for radioactivity after the clams had taken up suspensions of the microorganisms labeled with sodium acetate- ^{14}C . Determinations were made on the adductor muscle and on clam body fractions at different time intervals after feeding. Significant radioactivity was de-

tested in both the adductor muscle and the remaining clam body with both types of feeding. The ratio of label in the adductor as compared to the remaining body was .14 after 3.5 hours and .22 after 5 hours in *Euglena* fed clams and .05 after 3 hours in *Serratia* fed clams. *Supported in part by grants from the University of North Carolina Sea Grant College Program and the East Carolina University Research Committee.*

(253)

Insect Colonization of Leaf Packs in a Small Stream

A. Carol J. O'Dillon and S. D. Caldwell

Georgia College

Autumn-shed leaves of tulip poplar, sugar maple, white oak, water oak, dogwood and sweetgum were gathered to make single species leaf pack analogues which were suspended in riffle and pool areas of a small stream, King's Creek, Baldwin County, Georgia. At predetermined time intervals from 14 November 1979 to 28 January 1980, the leaf packs were removed from the stream and analyzed for aquatic insect fauna. Colonization patterns of the total number of aquatic insects, the family Chironomidae and eight individual genera were determined. In general, more aquatic insects were collected in leaf packs in riffle areas than in leaf packs in pools. The majority of the aquatic insects collected in King's Creek showed the greatest preference for dogwood leaves and the least preference for water oak. Invasion of the leaf packs were immediate and was followed by two peaks of invasion which occurred on days 7 and 77 of exposure.

(254)

Parasitism of the Dragonfly *Celethemis eponina* (Insecta: Odonata) by Water Mite Larvae

Mark W. LaSalle

University of Southwestern Louisiana

A large emergence of adult *Celethemis eponina* Drury occurred from a set of small ponds in Lafayette, Louisiana during the last week of June 1980. A collection of newly emerged adults showed an 88.9 percent incidence of parasitism by water mite larvae. An average of 30.75 larvae per host was observed on those dragonflies infested. The larvae were located predominantly on the ventral surfaces of the thorax and abdomen of the host. A second collection four days later showed a reduced percent incidence of 61.5 percent. An average of 7.5 larvae per host was observed on those dragonflies infested. The larvae that were present on the hosts at that time readily left the host when immersed in water. These observations suggest an interesting strategy of dispersion used by the water mite larvae.

(255)

Ecological Life History of *Baetisca berneri* Tarter and Kirchner from a West Virginia Stream (Ephemeroptera: Baetiscidae)

Donald Tarter, William Morris,
and Dwight Chaffee

Marshall University

The ecological life history of the mayfly *Baetisca berneri* Tarter and Kirchner was studied intensively at Laurel Fork, Mingo County, West Virginia, between December 1974 and November 1975. Length-frequency distributions indicate a univoltine life cycle. Based on monthly samples, the nymphs reach their greatest growth rate from September to October (25.5%). Monthly foregut analysis indicates that the nymphs were detritivorous in their feeding habits, supplementing their diet with diatoms (primarily *Synedra*, *Cymbella*, *Nitzschia* and *Gomphonema*) and filamentous algae. Laboratory reared nymphs emerged from May 7 to May 31. Reared subimagos survived about 24 hours. Laboratory studies confirmed the field observation of sand, gravel, and small stone substrate preference. Nymphs preferred lighted areas to unlighted areas. The chi-square test was applied to 197 nymphs and no significant deviation from the 1:1 sex ratio (0.05 level) was found. Total egg counts ranged from 1001 to 2375 per females (mean, 1899). The eggs were nearly round, sculptured, and averaged 0.18 millimeters in diameter.

(256)

The Effects of Fly Ash on Three Species of Stonefly Nymphs (Plecoptera)

Richard A. Lechleitner, Donald S. Cherry,
John Cairns, Jr., and David A. Stetler

Virginia Polytechnic Institute and
State University

Nymphs of three species of stoneflies, *Allonarcys proteus*, *Peltoperla maria* and *Pteronarcys dorsata*, were exposed to various components of fly ash effluents (pH shifts, ash particulates and heavy metals). Static 96-hr bioassays were conducted to determine the LC50 values under: 1) acidic conditions (pH 7.5-1.75), 2) basic conditions (pH 7.5-12.5), and 3) fly ash concentrations (10-5800 ppm total suspended solids), with measurement of heavy metal concentrations. *P. dorsata* was the least resistant to low pH with an LC50 value of 3.55 while *P. maria* and *A. proteus* showed lower LC50 responses of 3.05 and 2.95, respectively. Under basic conditions, *P. maria* was the least resistant (96 hr LC50 = 10.35) while *A. proteus* and *P. dorsata* were more tolerant of the alkaline conditions (96 hr LC50 = 12.10 and 12.00, respectively). From fly ash exposures, all species were resistant to the effects of the ash particles and associated heavy metals. The effects of fly ash particulates and extreme pH conditions on the ultrastructure of gill tissue of *P. dorsata*, as evaluated by transmission electron microscopy, are discussed.

(257)

Notes on the Post-diapause Life History
of Two Species of Taeniopterygidae
(Insecta: Plecoptera) with a
Description of the Mature Nymphs

Charles H. Nelson

University of Tennessee at Chattanooga

The post-diapause life histories of two winter stoneflies, *Oemopteryx contorta* (Needham and Claassen) and *Strophopteryx linata* (Frison), were studied from October 1977 to May 1978 in the Ramsay Prong of the Little Pigeon River, Great Smoky Mountains National Park, Tennessee. Growth in both species corresponded to a modified slow cycle in which development during the winter is rapid and continuous. Examination of cephalic-width size frequency histograms indicates a small number of post-diapause instars. Distinguishing features of the ultimate instar nymphs of both species include pattern of body coloration, presence or absence of a vesicle underlying the male ninth abdominal sternal cuticle, number of unsclerotized abdominal sternites, abdominal tergal setal pattern, and type of setae on proximal cercal segments.

(258)

A Data Analysis and Retrieval System
for Environmental Resources (DARTER)

Maurice F. Mettee, Patrick E. O'Neil,
and Danny Wilson

Geological Survey of Alabama

The DARTER system was originated to aid in the analysis of large environmental data bases. Currently, the system is designed to analyze ecological and population data relevant to fishes and benthic macroinvertebrates. DARTER was designed for easy access and use by non-computer personnel. The six basic operations of DARTER are: (1) to prepare data in a form available for information requests; (2) to analyze a single collection site through time; (3) to analyze concurrent collections during one collection period; (4) to prepare a total species listing for a research project; (5) to compare species abundance and size over environmental gradients; and (6) to compare the flora or fauna in two different creeks with overlap indices. Ultimately, DARTER will incorporate and analyze water-quality data as well as use preprogramed data plotting routines.

(259)

A Computerized Approach to the
Handling of Vertebrate Collection Data

Edward F. Menhinick and Norman F. Innes

University of North Carolina at Charlotte

Advances in computer technology, including remote terminals, printers and graphic devices, have facilitated the rapid handling of vertebrate collection data at UNCC. This paper describes the uses of a locally written computer program which produces required reports, up to date inventories of catalogued vertebrates,

and computer printouts for a variety of purposes. In addition, the program's output is used to automatically produce specimen labels and has built in geographic cross references for ease in mapping distributions. The advantages of this program include: (1) ease of data entry—single entry of repetitive station data, abbreviated mnemonics for species entries, automatic generation of family names (2) flexibility of output—data sorted and listed in any sequence of fields, limited to various subsets of the data (3) form of output—printed listings, machine lettering for production of labels, magnetic tapes formatted to meet user requirements, and (4) the speed and accuracy inherent to computer technology.

(260)

Growth and Development of Larval
Rana utricularia (Amphibia: Anura) at
Constant and Fluctuating Temperatures

David H. Nelson

University of South Alabama

Larval southern leopard frogs were reared (from eggs) for six weeks in environmental chambers at constant (10°C, 17°C, 25°C) and fluctuating (cyclic and non-cyclic) temperature regimens. Fluctuating temperatures varied from 10°C to 25°C with mean values of 17.5°C. Stages of development and body lengths were compared after three weeks. At the termination of the six week study, the stages of development, body lengths and body weights were recorded. Among the constant temperatures (as expected) the values for all parameters were directly related to temperature. Although the differences in some cases were slight, values for all parameters were greater at the noncyclic, fluctuating temperature regime than at the cyclic, fluctuating regime. The significance of constant vs. fluctuating temperatures is discussed.

(261)

Taxonomic Problems in the
Eurycea longicauda Complex
(Amphibia: Caudata)

A. Patrick H. Ireland

Radford University

Currently, three subspecific forms of *Eurycea longicauda* are recognized: *longicauda*, *guttolineata*, and *melanopleura*. *Eurycea longicauda longicauda* and *E. l. melanopleura* intergrade in an apparent zone of secondary contact. These populations fit within the current concept of subspecies. The Blue Ridge escarpment forms a distinct barrier between *E. l. longicauda* and *E. l. guttolineata* and these two forms are allopatric along their northern interface. In North Carolina and Tennessee *E. l. longicauda* and *E. l. guttolineata* are sympatric without evident intergradation. *E. l. longicauda* and *E. l. guttolineata* apparently intergrade in northern Alabama and adjacent states. Some workers feel that *guttolineata* and the apparent intermediate populations found in northern Alabama both warrant recognition as species but the evidence is inconclusive.

(262)

Comparison of Long Bone Development in Two Salamander Species, *Plethodon glutinosus* and *Desmognathus quadramaculatus*

D. I. Pav, J. L. Robertson, and H. J. Araya

East Tennessee State University

Two salamander species, the fully terrestrial *Plethodon glutinosus* and the aquatic *Desmognathus quadramaculatus*, both indigenous to eastern Tennessee, were used in this investigation of development of long bones. Both species were divided into relative age groups, using snout-to-vent length as the indicator, from immature to mature individuals. Six long bones, the humerus, ulna, radius, femur, tibia, and fibula were dissected, measured, and the cytomorphology was examined by light and electron microscopy. In both species, fully formed epiphyseal plate is present already in the youngest group, and persists through the mature stages. However, while *Plethodon glutinosus* shows only a moderate amount of endochondral bone replacement and forms trabeculae or bone spicules only sporadically in most mature groups, *Desmognathus quadramaculatus* shows in the humerus and femur extensive endochondral bone production with trabeculation present even in immature stages. The epiphyseal plate is much reduced in mature stages in *Desmognathus quadramaculatus* and is walled off by a thin bony plate on the diaphyseal surface.

(263)

The Female Reproductive Cycle of *Sternotherus odoratus* in Central Alabama (Reptilia: Chelonia)

Ken R. Marion and Roger J. McPherson

University of Alabama in Birmingham

One hundred female *Sternotherus odoratus* were examined during 1979–80. Maximum ovarian mass occurred from March through June, while minimum values were reached during July–August. By December, ovarian mass was not significantly different from early spring. Vitellogenesis began during mid-September and continued throughout fall and early winter. Maximum oviduct mass occurred during spring and early summer, whereas minimum sizes were found during winter. Most females lay at least two clutches of eggs from March through July, with some females possibly having three. The mean clutch size was 2.8 and was positively correlated to body size. Females reached maturity at 65–75 mm carapace length.

(264)

Seasonal Lipid Changes in *Sternotherus odoratus* Related to Reproduction and Maintenance

Roger J. McPherson and Ken R. Marion

University of Alabama in Birmingham

Two hundred and twenty-six animals were examined during 1979–80 to determine seasonal cycling of lipids in body, liver, ovary, and plasma. A gravimetric

determination of body fat revealed that minimum values occurred during late winter and early spring. Greatest body fat values, as much as 400 mg/g dry body mass, were found in large females during the fall. Body fat levels in males were less than those of females throughout most of the year. Liver sizes likewise followed the same pattern, with minimum values occurring during winter and maximum levels during fall. Plasma lipid levels peaked during the fall. Seasonal lipid fluctuations will be discussed in relation to natural history and the reproductive cycles of *Sternotherus odoratus*.

(265)

Size, Age Structure and Sex Ratios in Populations of the Freshwater Turtles *Chrysemys picta* and *Sternotherus odoratus* in Virginia

Joseph C. Mitchell

University of Richmond and

University of Tennessee

A mark-recapture program on a community of freshwater turtles near Richmond, Virginia, has been in progress since May 1979. The site consists of a shallow, eutrophic, golf course lake, plus 325 m of creek that includes a beaver pond. September 1980 estimates of population sizes are 983 for *Chrysemys picta* (671 marked and 1443 recaptures) and 822 for *Sternotherus odoratus* (497 marked and 758 recaptures). Sex ratios are 1:1.03 (males:females) for the *C. picta* population and 1:1.33 for *S. odoratus*. Population age structures of the two species are compared with reference to local selective pressures. Demographic parameters related to age are also presented.

(266)

Loggerhead Sea Turtles, *Caretta caretta*, Captured in Port Canaveral, August through November 1980

A. Terry Henwood

NMFS and Auburn University

From late August through November of 1980, daily trawling effort was expended in the capture of sea turtles inhabiting the ship channel of Port Canaveral, Florida. All captured animals were measured, weighed, sexed and released at predetermined locations. Tag returns from this operation and recaptures from previous tagging efforts were analyzed. Length-weight measurements indicated a predominance of juvenile and sub-adult individuals within the channel during this time period.

(267)

Correlation of Nesting Attempts of the Atlantic Loggerhead, *Caretta caretta*, with Tidal Cycles: A Final Word?

Nat B. Frazer

University of Georgia

Efforts of a number of tagging projects to correlate nesting behavior of loggerhead sea turtles with tidal cycles have produced conflicting results. Possible

causes of the discrepancies include: 1) differences in the frequency (i.e., diurnal vs. semidiurnal) and mean daily amplitude of tides at different study sites, 2) disparities in the frequency of beach patrols among the various projects, and 3) failure of some investigators to frame the question appropriately when analyzing their data. Projects which conduct nightly patrols from dusk until dawn on an hourly basis throughout the nesting season on beaches with semidiurnal tides and relatively high (c. 2 meters) mean daily tidal ranges seem more likely to show a correlation between nesting attempts and tides. Data from one such project on Little Cumberland Island, GA, show a correlation between nesting attempts and tides and suggest implications for future tagging programs.

(268)

First Successful Nesting of the Green Sea Turtle, *Chelonia mydas* in North Carolina and North of Georgia

Frank J. Schwartz,¹ Charles Peterson,²
Hugh Passingham,² John Fridell,²
and Julian Wooten²

*Institute of Marine Sciences, University of
North Carolina¹ and U.S. Marine Corps Base,
Camp Lejeune²*

Nesting of the green sea turtle, *Chelonia mydas*, is confirmed for the first time in North Carolina as well as north of Georgia. Five nests, totaling 819 eggs, resulting from nestings by a tagged female, were laid between June and August 1980 (25 June, 168 eggs; 8 July, 183; 21 July, 166; 2 August, 157; and 17 August, 145). Two nests relocated but incubated on the beach at Camp Lejeune, Onslow County, North Carolina for 58 days produced 147 (87.5% hatch) and 148 (80.9%) hatchlings respectively. All three nests incubated artificially at 82 F (27.8 C) yielded fewer hatchlings after 49, 55, and 59 days respectively. Sizes and weights of beach incubated hatchlings were: 25 June, 50.8 mm mean straight line carapace length (range 47.6–53.8 mm), mean weight, 25.8 g (range 22.8–29.9 g); 8 July, 52 mm CL (range 48.7–54.6 mm) and 26.4 g (range 23.7–28.3 g). The artificially incubated hatchlings sizes and weights were: 21 July, 47.0 mm CL, 19.2 g; 2 August, 47.9 mm CL (range 46.5–51.0 mm), 23.0 g (range 21.3–24.9 g); 17 August, 47.8 mm CL (range 46.5–50.0 mm) and 23.0 g (range 20.0–24.5 g). All but 15 hatchlings were tagged with internal wire coded tags and released at Camp Lejeune. One white and three deformed specimens were among the beach incubated hatchlings.

(269)

Infrared Reflectance in Chameleons (Chamaeleonidae)

C. Kenneth Dodd, Jr.

U.S. Fish and Wildlife Service

The reflectance of infrared light is a phenomenon only recently reported in amphibians and never reported in reptiles. Five species of chameleons (*Chamaeleo hohnelii*, *schubotzi*, *gracilis*, *jacksoni*, *fischeri*) were photographed shortly after capture in Kenya using Kodak infrared film ($F = 5.6-16.0$, $ASA = 160$, $1/125$ sec.). Two species (*gracilis*, *fischeri*) reflected in-

frared light while the others did not. The importance of infrared reflectance may be that it allows the animal to blend in with its surroundings for both the avoidance of predators and the capture of prey. Why some species of *Chamaeleo* reflect infrared light while others do not is as yet unknown.

(270)

Lizard Reproduction: Habitat Specificity and Constraints on Relative Clutch Mass

A. Laurie J. Vitt

University of Georgia

The iguanid lizard *Platynotus semitaeniatus* is adapted morphologically and behaviorally to use rock crevices to escape predation. Attendant reproductive adaptations reveal an adaptive compromise where costs incurred from reduced reproductive investment per episode are outweighed by advantages associated with the use of a relatively predator-free refugium thereby increasing adult survivorship and thus lifetime reproductive success.

(271)

Seasonal Spermatogenic and Androgen Cycles in the Lizard *Sceloporus undulatus* in North Central Alabama (Reptilia: Squamata: Iguanidae)

Rose B. McKinney and Ken R. Marion

University of Alabama in Birmingham

The annual reproductive cycle of male *Sceloporus undulatus* in north central Alabama was evaluated. Maximal spermiation occurred in March–April. Testicular regression began in May, and by early June spermatids and spermatocytes were greatly reduced, though lumens of seminiferous tubules and epididymides still contained numerous spermatozoa. By August–September primary spermatocytes appeared and by mid-October secondary spermatocytes and early spermatids were apparent. During February testes contained advanced spermatids and a few spermatozoa, but epididymides remained empty and atrophic. Plasma testosterone levels were determined by radioimmunoassay and were compared to spermatogenic stages. Levels peaked in early spring in association with high testis weights, whereas minimal testosterone levels occurred in late summer when testis weights were reduced.

(272)

A Comparative Study of Reproduction in Two Populations of *Anolis carolinensis* (Class Reptilia)

Julia Wade and A. C. Echternacht

University of Tennessee

The seasonal reproductive cycles of two populations (Tennessee and Louisiana) of the lizard, *Anolis carolinensis*, are described and compared. Tennessee males have larger mean testes weights during the peak of the breeding season and show more dramatic increases and decreases in testes size during the rest of

the cycle than their Louisiana counterparts. Tennessee females have a shorter breeding season and have two oviductal eggs more frequently than the Louisiana females. Seasonal hormonal and histological changes will be described for each sex. Other parameters of the life history of this species will be discussed, and generalizations made concerning the intraspecific variability in reproductive strategies shown by these two populations.

(273)

SEM and Histological Observations on Ecdysis in Terrestrial and Aquatic Snake Genera

Thomas P. Forks and Sam W. Rosso
University of Southern Mississippi

SEM observations involving a variety of squamate genera indicate a surprising intra-specific consistency in dorsal scale ornamentation. Examination of cephalic scales and ventral scutes indicates a variation from the dorsal scale organization. Keelous and akeelous species exhibit species-specific surface features. *Regina rigida*'s akeelous surface features diverge from the typical ornamentation observed within that genus. Differences in subspecific ornamentation within the *Nerodia fasciata* group are slight. In regard to age differences, the periderm exhibits significant deviation from the parental organization. Included in both the peridermal and adult ornamentation were faint markings corresponding to the cell boundaries of the underlying α keratin. Histological studies indicate a proliferation by the stratum germinativum to form an inner epidermal generation which subsequently undergoes keratinization, prior to the shedding of the older, outer epidermal generation. Also of significance is the increased number of cellular layers within the inner epidermal generation that are involved in keratinization of older specimens.

(274)

Reproductive Cycle of *Nerodia taxispilota* (Reptilia: Colubridae) at the Northeastern Edge of its Range

David R. White, Joseph C. Mitchell,
and William S. Woolcott
University of Richmond

The seasonal reproductive cycle of *Nerodia taxispilota* was examined in a population inhabiting the Appomattox River and its tributaries near Hopewell, Virginia. In males, testes are small April-June, largest in August and decreased in size September-November. The female cycle is annual and 80% or more of the females are gravid in a given year. Vitellogenesis occurs April-early June, ovulation in mid-June, and parturition in late August-mid-September. Fecundity increases with increasing female body size. Mean total clutch size is 33.9 and mean clutch size of full-term embryos is 28.0. Males average 608 ± 112 mm snout-vent length and females 738 ± 201 mm SVL. Sex ratios do not differ significantly from 1:1 in spring and summer but males predominated in autumn. Frequency of tail injury does not differ significantly between sexes but adults have higher proportions of partial tails than juveniles.

(275)

The Correlation of Selected Predictors with Student Performance in Introductory Biology Courses

Wendell E. Wall
University of Alabama in Birmingham

The study was designed to identify students who do not have the skills or basic knowledge necessary for the successful completion of an introductory biology course (cell biology) for majors. Statistical tests were used to correlate students' performance in cell biology courses with ACT scores, high school grades, The Nelson-Denny Reading Test, and a multipartite diagnostic pretest. The latter was composed of subtests of basic science, chemistry, biology, and Ellen Korn's Cognitive Diagnostic Test. Results of the analyses will be presented and discussed. The implications for the needs of remedial programs will be addressed.

(276)

Niche Partitioning and Rearrangement in an Undergraduate Advanced Ecology Curriculum

David Hillier and Charley M. White
University of Wisconsin-Stevens Point

A coordinated two year ecology curriculum experiment was undertaken in response to 1—wide differences in needs, interests, experience, and aptitudes of our students, and 2—curricular restriction of most students to either plant or animal ecology. With no increase in commitment of staff time, existing elective three-credit courses in plant and animal ecology were partitioned, with some expansion, but minimum revision, into ten one- or two-credit lecture and laboratory modules. Principal benefits to date include substantial realization of the primary objective: opportunity for each individual to obtain a personally optimum combination of instruction and experience without a disproportionate investment of credit hours. Difficulties include anticipated and minor problems of scheduling, advising, and coordination. Unanticipated academic consequences include a clear impetus toward module proliferation during a time of anticipated academic retrenchment, and a tendency toward increased detail and scope at the expense of theory and general principles.

(277)

Marine Awareness: A High School Approach to Marine Science

John Dindo and Johnny Booker
Dauphin Island Sea Lab

The expanded search for oil and natural resources in the last ten years has enlightened people to the importance of the oceans. Despite the scientific and industrial utilization of the oceans, education on the high school level in the marine field is very limited. Coastal areas have a tendency to offer limited marine programs with very little marine science being taught inland. In a recent dissertation by Dr. David Wilson, University of Alabama, an overall opinion that curriculum core objectives of science education could be

met utilizing marine science programs. The Marine Environmental Science Consortium on Dauphin Island offers a unique program in marine awareness for high school students. Aspects of marine biology and oceanographic concepts are taught on an introductory level. The educational approach to high school marine science through a generalized marine awareness could be used as a model for other schools. The success of this program and others like it will be measured in the increased knowledge of the oceans potential and proper management of its vast resources.

(278)

The Enhancement of a Course in Bioethics by Utilizing Non-science Literature

Kenneth D. Burnham

University of Tennessee

All of us bring our cultural and personal values with them when attempting to arrive at decisions on the many controversial issues included in Bioethics. Attempts at scientific objectivity are often nonproductive or even counter-productive in formulating one's position on euthanasia or *in vivo* fertilization. Although the technological innovations are recent, the human values applicable to the issue have frequently been considered in fiction and non-fiction. Involvement in bioethical issues is more readily accomplished when a student identifies with a character in a story, e.g. McMurphy in Kesey's *One Flew Over the Cuckoo's Nest* where the issue is personality change as a result of psychosurgery. I will present some bioethical issues, selections from literature, and values which might be derived from an examination of the presentations.

(279)

Values Education: Attitudes of Biology Teachers in Tennessee Colleges and Universities

R. G. Franke

University of Tennessee-Chattanooga

A survey was taken of teachers of biology at most institutions of higher learning in Tennessee. Information from responses regarding the significance to college and university biology teachers of the values dimension of certain issues in the "new" biology and the degree to which teachers include these issues in their teaching is presented. Attitudes of biology teachers in 2-year colleges and 4-year schools, and in public institutions and private, especially religiously-affiliated schools are contrasted. Correlations between attitude toward values education and demographic information are drawn.

(280)

The Effects of Imagery Stimulation on Achievement in College Biology

Carolyn F. Bradley

Macon Junior College

This study examined effects of three modes of visually presented information pertinent to mitosis, mei-

osis, and DNA structure on the achievement of seventy-three college biology students of differing levels of spatial visualization ability and cognitive development. One group (N = 24) used raised diagrams, another (N = 24) used projected slides of the raised diagrams, and the third group (N = 25) used transparencies and assembled models. Weekly topic tests were the measures of immediate achievement. A test on all three topics given at the end of the study was the measure of retained achievement. All tests required both verbal and visual responses. A treatment $\times$ visualization skill $\times$ cognitive level research design was used. Analysis of covariance procedures revealed a significant aptitude $\times$ treatment interaction on the DNA visual response subtest. A relatively high positive correlation ($r = 0.61$) was found between spatial visualization ability and level of cognitive development in this sample.

(281)

Predicting College Biology Achievement Using Academic Aptitude, Logical Thinking Ability, and Other Student Entry Characteristics

**Russell H. Yeany, Edwin A. Helseth,
and William E. Barstow**

University of Georgia

Influences of such entry characteristics as academic aptitude, locus of control, and cognitive development on the achievement of university biology students were the focus of this study. Data were collected on subjects in a large enrollment introductory-level university biology course. The entry variables were then regressed against four different measures of achievement given across each quarter. Results indicated a large and significant portion of variance in achievement is predicted by these entering characteristics of students with SAT quantitative as the strongest predictor. Several of the findings point out a need to match instructional strategies to student's skills in order to improve learning at the college level.

(282)

Learning Through Teach-ins

William J. Koch

University of North Carolina at Chapel Hill

This session is designed to give the college teacher experimental knowledge of the Teach-in Method of learning and teaching. A short lecturette will introduce the teach-in as an instructional method facilitating "higher-order learning." Participants will do a short teach-in, "Communication in the Ecosystem," that can be used as an interesting way to introduce students to biological communication through selective reading of articles taken from *Science*, *Science News*, *Scientific American*, *American Naturalist*, *Botanical Gazette*, *Soil Science*, and a book, *The Dancing Bees*. There will be a wrap-up session dealing with applications of the teach-in method to various situations.

(283)

Primary Production and Elemental Composition of *Scirpus olneyi* in a Mississippi Coastal Marsh

Jerry F. Hall and Samuel P. Faulkner

Mississippi State University

An ecological survey of seasonal flux in standing crop and elemental composition in *Scirpus olneyi* was conducted at Bellefountain Marsh on the Mississippi Gulf Coast. This species exhibited a bimodal growth pattern for both above- and belowground biomass components, with maximum foliar standing crop estimated to be 495 g m^{-2} in mid-June, and maximum belowground standing crop estimated at 12.2 kg m^{-2} during August. Maximum foliar standing crop coincided with a spring belowground peak, while maximum belowground standing crop occurred during autumnal secondary shoot growth. Levels of foliar N, P, K and Mg declined in season, and paralleled observed phenological events. The occurrence of secondary autumnal shoot growth compensates for energy losses resulting from spring vegetative and reproductive efforts by providing additional photosynthate for overwintering storage rhizomes. Primary production values will also be discussed.

(284)

Assimilative Capacity of the Sediment-water System of a Riverine Tupelo-cypress Swamp under Sustained Nutrient Loading

H. David Bradshaw and Mark M. Brinson

East Carolina University

An experiment on the effects of sustained nutrient loading was designed to expose the sediment-water system of a swamp to weekly additions of nitrate, ammonium, phosphate, and nutrients in secondarily treated sewage effluent. These treatments were applied to individual chambers (1.4 m^2) at rates of $1 \text{ g m}^{-2} \text{ wk}^{-1}$ for nutrients and 5 cm wk^{-1} for effluent over a 46 wk period. Nutrient concentration changes in surface water 1 wk after addition indicated the level of assimilation. Compared with untreated controls, there was little tendency for nitrate accumulation in surface or subsurface water due to the high denitrification potential of the anaerobic, organic rich sediments. Ammonium treatments initially showed a slow transfer of ammonium from surface water to both subsurface water and the exchangeable ammonium pool in sediment. Once these pools became saturated, ammonium accumulated in surface water. Behavior of phosphate treatments was similar to that of ammonium except that saturation occurred more rapidly.

(285)

Nutrient Mobilization Following Winter Fires in an Irregularly Flooded Marsh

Samuel P. Faulkner and Armando A. de la Cruz

Mississippi State University

This study evaluated the effects of controlled winter fire on nutrient pools in an irregularly flooded marsh

in the St. Louis Bay Estuary, Mississippi. Nutrient levels were determined in pre-fire vegetation, post-fire regrowth, pre-fire and post-fire sediments, combustion residues and reference materials from unburned adjacent sites. Post-fire soil chemistry was characterized by transitory elevation of pH, and extractable P, Ca and K at the sediment surface. Although input of ash-borne nutrients to the marsh appeared minimal, N loss determined experimentally in the laboratory from combusted plant materials was estimated to be significant during conflagration. Increase in elemental concentrations, particularly N, in regrowth tissues of *Juncus roemerianus* and *Scirpus robustus* appeared associated with the fire event. Input of ash-borne nutrients, soil heating, and increased isolation, may have contributed to the nutrient increases noted in the plants from burned areas.

(286)

Lowland Forest Site Conversion and Water Quality: Experimental Design and Techniques

Jon D. Jones, Thomas M. Williams,
and George R. Askew

Baruch Forest Science Institute of
Clemson University

Conversion of hydric forest sites for commercial production of softwoods is increasing in the southeast due to the increasing demand for this resource and the ubiquity of this site type in the area. The general sequence of activities is to install a ditch drainage system, harvest the natural stand, site prepare, fallow for one year, burn, bed, plant superior pines and fertilize on certain soils. These practices may alter water quality in the watershed and subsequently downstream through augmentation and/or conservation of various drainage water constituents. To assess the potential effects of site conversion on water quality, 9 contiguous subwatersheds in various stages of conversion from natural (unmanaged) to a 15-year old pine plantation will be monitored by storm events on a monthly basis for such drainage water parameters as flow, suspended sediment and nutrient content. A description of conversion process, watershed layout, sampling design, and sample analysis will be presented.

(287)

Nutrient and Heavy Metal Concentrations in Plants from Olivine Outcrops and Derelict Mine Sites in North Carolina

Diane E. Wickland¹ and Laura Mansberg²

University of North Carolina-Chapel Hill,
Savannah River Ecology Laboratory,¹ and
North Carolina State University²

Community studies of the Buck Creek Olivine Barren in Nantahala National Forest and of various derelict mine sites in the Carolina Slate Belt of North Carolina have identified sites with soils containing abnormally high concentrations of several phytotoxic elements. The mine site soils are high in Cu, Pb, Zn, and Mn. The olivine outcrop soils contain unusual concentrations of Mg, Zn, and Cu with low ratios of Ca to Mg. Plant tissue samples were collected from these and several control sites for elemental analyses.

N, P, K, Ca, Mg, Fe, Mn, Cu, Zn, Pb, Ni, Cr, and Co concentrations were determined for most samples by means of atomic absorption spectroscopy. Tissue concentrations of these elements will be reported for *Acer rubrum* L., *Sassafras albidum* (Nuttall) Nees, *Senecio aureus* L. or *S. smallii* Britton and a few other species. Patterns of uptake will be compared among the sites sampled.

(288)

Fire and Nutrient Turnover in the Sandhills Turkey Oak (*Quercus laevis*) Association, South Carolina

Sarah W. Workman and Kenneth W. McLeod

Western Washington University and
Savannah River Ecology Laboratory

The fall-line sandhills occupy the inner border of the coastal plain in the Carolinas and eastern Georgia. Sites selected for this study were in Barnwell County, South Carolina. *Quercus laevis* and *Q. margareta* dominated the selected scrub oak stands while *Pinus palustris*, *Q. incana*, and *Q. marilandica* were present in lesser abundance. Soils of the study area were deep sands with low cation exchange and moisture holding capacities. The short term effects of seasonal burning on the association's nutrient budget were studied on plots burned in August 1980 or January 1981. Results from nutrient analyses of litterfall samples and of post-burn ash and soil samples will be discussed.

(289)

The Effects of Residual Fertilizer on Net Productivity of Old-field Plant Communities

J. E. Pinder, III and T. A. Christiansen

Savannah River Ecology Laboratory

Odum (1960; Ecology 41:34-49) observed declining net-productivity rates for the first several years of succession on sandy soils of the Savannah River Plant and hypothesized that the initially high net-productivity rates were due to residual fertilizers in the soil. However, Golley and Gentry (1966; Oikos 15:185-199) noted little difference in standing crops in first-year old-field communities on areas where the previous crop had been fertilized and where it had not been fertilized. To determine if residual fertilizers influence net-productivity of early old-field communities, we compared plant community structure, standing crops and net productivity of first-year and second-year communities on sections of an abandoned corn field where we either had or had not fertilized the corn. We also performed nutrient addition experiments to determine which nutrients were limiting productivity on fertilized and unfertilized sections of the field.

(290)

Biomass and Litter Accumulations in the Southeastern United States

Elgene O. Box

University of Georgia

Accumulations of both standing biomass and lying litter can be thought of as balances between climati-

cally controlled production and loss processes. Recent climate-based models have permitted estimation of world biomass and litter accumulation patterns. In much of the Southeast, where soil is not limiting, these models can be compared with known actual accumulations and equilibration periods in order to improve understanding of both processes and vegetation structures. Litter patterns suggest climatic controls on both vegetation and soil type. Biomass and litter models, in combination with fire frequency, may provide useful information on nutrient cycling and management options.

(291)

In Situ Decomposition of Dead Tissues of Selected Tidal Marsh Plants

Judy P. Stout and Armando A. de la Cruz

University of South Alabama and
Mississippi State University

Recognition of salt marsh plant detritus as a source of energy and nutrients for estuarine animals prompted investigation of *in situ* decomposition and elemental analyses of four plants at various stages of decay, namely: *Spartina alterniflora*, *Juncus roemerianus*, *Distichlis spicata*, and *Spartina patens*, commonly growing in Alabama and Mississippi Gulf Coasts. Annual decomposition of aboveground material for these four plants were 86, 44, 38, and 36% respectively. There was a general decrease in carbon and hydrogen, and a slight increase in nitrogen, phosphorus and caloric content of aboveground tissue during decomposition.

Annual loss of belowground biomass due to decomposition was most consistent with depth for *J. roemerianus*, losing 25% in the upper 10 cm and 22% at depths of 11-20 cm. The greatest belowground loss of 31% was for *S. alterniflora* at the 11-20 cm depth with only 14% loss in the upper 10 cm. Decomposing belowground material did not exhibit any discernable patterns of change in tissue nutrient or caloric content.

(292)

Decomposition of Longleaf Pine Litter

Kenneth W. McLeod and Casey Sherrod, Jr.

Savannah River Ecology Laboratory

In pine plantations of the southeastern United States, considerable quantities of litter accumulate on the forest floor. Release of nutrients from this litter is important in maintaining productivity. Studies will be reported that indicate that decomposition of pine litter is very slow (~52% weight lost in 4 years for needles and 28% in 2 years for logs). Also elemental loss rates are dependent on whether the elements are bound in structural components, from which they are lost very slowly, or found in other components from which leaching can readily occur. The slow decomposition rate may be a mechanism to conserve nutrients and compensate for the low cation exchange capacity of the sandy soils of the Coastal Plain. Also discussed will be the impact of some forest management practices which would seriously alter the elemental inputs from the decomposition pathway and potentially alter future productivity.

(293)

Comparison of Decay Rates of Confined Versus Unconfined Litter in The Great Dismal Swamp

Frederick K. Yates and Frank P. Day, Jr.
Old Dominion University

Data collected from two previous years suggests that both frequency and duration of flooding have a strong influence on decomposition and nutrient turn over rate (N, P, K, Ca, & Mg) in the swamp. This study was executed 1) in order to obtain a third year of data for evaluating year-to-year variation, 2) to compare the litter bag technique of rate determination with the unconfined leaf-pack technique, and 3) to compare both of these methods with a pure cellulose standard for decomposition. A secondary objective was to qualitatively study soil fauna composition. 1980 has been the driest year on record for south-eastern Virginia. Data are compared with the 2-previous "normal" years and an assessment of drought impact in the Swamp is noted.

(294)

The Effect of Benthic Algae on Nitrogen and Phosphorus Cycling in a Cypress Stand in The Great Dismal Swamp, Virginia

J. A. Atchue, III and Frank P. Day, Jr.
Old Dominion University

It has been postulated by several authors that the assemblages of benthic algae which are often found in swamp or wetland habitats act as a nutrient conservation mechanism. This has been investigated in a Cypress stand in the Great Dismal Swamp where benthic algae is present during the winter and spring. The algae occur patchily throughout the stand and were found to have a biomass of $19.53 \text{ g} \cdot \text{m}^{-2}$ (d.w.). With the advent of spring leafout the algae begin to die back and are incorporated in the litter layer. It is likely that at the time of leaf out the algae are releasing quantities of nutrients useful in both plant and bacterial growth. Enhanced bacterial growth would lead to increased decomposition. Algal litter is evident as late as September, four months after the die back.

(295)

A Microcosm Study of Effects of Flooding on Litter Decomposition

Frank P. Day, Jr.
Old Dominion University

Litter decay rates and nutrient dynamics were measured in microcosms which simulated five different flooding regimes with other factors held constant. Soil and litter were collected from a single site in the Great Dismal Swamp. Decay was most rapid in the treatment with alternating flooded and unflooded conditions and was lowest in the continuously unflooded microcosms. The individual microcosm with the most rapid decay rate was continuously flooded and contained a population of chironomids which hatched by chance. Nitrogen and phosphorus concentrations in the litter increased in all treatments. Calcium concentrations

increased in the unflooded microcosms and decreased in all treatments involving flooding. Magnesium and potassium concentrations decreased precipitously in the flooded microcosms and gradually and to a lesser extent in the unflooded treatment.

(296)

Site Variation in Foliage Nutrients in The Great Dismal Swamp

Bruce J. Bandle and Frank P. Day, Jr.
Old Dominion University

Acer rubrum and *Nyssa sylvatica* are two tree species which exhibit 100% presence in four vegetational communities in The Great Dismal Swamp of Virginia. Significant differences in the nutrient levels of their leaves exist intraspecifically between sites. These differences may be attributed to site differences in topography and soil since climatic factors remain fairly constant over the geographic region. It was found that periods of inundation, soil pH, and other soil properties were major contributing factors in determining the nutrient concentrations in these species. Generally, most of the important tree species growing on these highly organic soils had lower nutrient concentrations than those growing on mineral soils which seems to be related to an availability problem.

(297)

Phytogeographical and Compositional Characteristics of the *Quercus oglethorpensis* Duncan (Fagaceae) Population in South Carolina

Garry G. Haehnle, Steven M. Jones,
and B. Allen Dunn
Clemson University

Quercus oglethorpensis in South Carolina is confined to Greenwood, Saluda, McCormick, and Edgefield Counties within the southwestern Piedmont. As a result of this study, the known range was increased approximately 25 percent. More importantly, the known density of the species within its range was increased from the 26 previously reported stations to 60 total stations, an increase of 130 percent. In those stands which comprised a minimum of 15 percent *Q. oglethorpensis*, 0.04 ha sample plots were established. Three vegetative types and species associations were determined by a combined classification-ordination of 12 samples. As the species occurs within a narrow range of site conditions, slight to moderate slopes and upland flats there appeared to be no relationship between stand ordination and an environmental gradient. Rather the three vegetative types appeared to result from past land use.

(298)

Hardwood Communities of the Savannah River Plant in Aiken, Barnwell, and Allendale Counties, South Carolina

Steven M. Jones and David H. Van Lear
Clemson University

Hardwood community types were determined by a combined classification-ordination of samples (58 0.04

ha plots) collected within the Savannah River Plant located in the upper Coastal Plain of South Carolina. Site conditions ranged from xeric, deep sands dominated by a turkey oak (*Quercus laevis*) overstory to wet floodplains with an overstory composed of bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*). The distribution of samples along the first axis of reciprocal averaging ordination (DECOR-ANA) appears to be related to this environmental gradient. The samples were classified into eight understory-overstory types identified by characteristic species.

(299)

A Vegetational Analysis of the Northeastern North Carolina Outer Bank's Marshes

James E. Perry and Frank P. Day, Jr.
Old Dominion University

Seasonal productivity and plant association similarities were measured for six brackish marsh sites in the North Carolina Outer Banks. Three randomly chosen $\frac{1}{4}$ m² plots were clipped at ground level from each site on a biweekly interval and returned to the lab. Each sample was separated into species, oven dried and weighed. A total of 38 species was collected from the sites. Five plant associations and three site groups were defined using a Czekanowski quantitative classification index. Sites 2, 3 and 6 formed group 1 dominated by a *Juncus-Eleocharis* association. Co-dominant associations of *Spartina-Mikania* and *Juncus-Eleocharis* were found in both sites 1 and 5 forming group 2. Group 3 consisted of site 4, an area recently exposed to dredge and fill activity.

(300)

Forest Regeneration on a Clearcut Appalachian Watershed

Lindsay R. Boring,¹ Carl D. Monk,¹
and Wayne T. Swank²

¹University of Georgia¹ and U.S. Forest Service²

Vegetation regeneration was sampled in three successive years on a clearcut southern Appalachian watershed and compared to an adjacent mature forest. For years 1, 2 and 3, net primary production equaled 1747, 7622, and 7385 kg ha⁻¹ yr⁻¹, almost matching the 8755 kg ha⁻¹ yr⁻¹ of the mature forest. Similarly, there was a 9% recovery of standing crop biomass by the third year with substantial accumulations of elemental standing stocks. Opportunistic woody species (*Robinia pseudo-acacia*, *Cornus florida*, *Liriodendron tulipifera*, *Acer rubrum*, and *Vitis aestivalis* var. *argenteifolia*) and herbaceous species (*Rubus* spp., *Solidago* spp., and *Aster* spp.) had the highest NPP, biomass, and elemental standing stock. Continuing research focuses on the role of *Robinia pseudo-acacia* in the successional dynamics of forest structure and nutrient cycling.

(301)

Experimental Revegetation of Maritime Tundra with Dune Grass, *Elymus mollis*

Raymond A. McCord and Clifford C. Amundsen
University of Tennessee

Maritime tundra on the Aleutian Islands, Alaska has been disturbed during military, construction, and research activities. Long term damage to the vegetation and soil erosion results unless revegetation is assisted by transplanting plants to the disturbed areas. Successful reproduction from seeds is uncommon in this region. *Elymus mollis*, a native dune grass, was selected for revegetation experiments on Adak Island, Alaska. It colonizes disturbed areas and its extensive rhizome and root systems stabilize exposed soil. The sprigs used in the experimental plots consisted of the above ground shoot, part of the rhizome and roots. Experimental conditions included different methods of site preparation, fertilization, planting densities, rhizome lengths, planting times, soil types and exposure. After two years, survival in all of the experimental plots was greater than 90 percent. Significant differences in the growth and condition of the plants were observed between different densities and exposures.

(302)

Revegetation of Upper Elevation Debris Slide Scars on Mt. Le Conte in the Great Smoky Mountains National Park

Susan M. Feldkamp
University of Tennessee

Nine debris slides on Mt. Le Conte ranging in age from 18 months to over 50 years were visited. Each debris slide was divided into three longitudinal sections: a head zone at the point of slide initiation, an erosion-transportation zone, and a transportation-gully zone at the end of the slide. Vegetation was sampled by means of 50 cm × 50 cm plots. Cover of lichens, mosses, and vascular plants and soil thickness beneath each vascular plant species was determined on each plot. Aspect, slope angle, relative moisture, percent bare rock, and the soil depth in the plot center were also noted. Comparisons between slides revealed differences in vegetation which were related to site factors and age. Within individual slides, differences were observed between zones and between margin versus center plots. These areas represent significant habitats for disturbance-dependent high elevation plant species.

(303)

Seed Rain and Seed Banks in the Vicinity of the Spruce-fir and Gray Beech Ecotone in the High Elevation Smoky Mountains

Noel B. Pavlovic and Edward E. C. Clebsch
University of Tennessee

Traps for wind and gravity dispersing seeds and soil cores were used to investigate the seed rain and seed banks adjacent to the spruce-fir and gray beech ecotone at a site in the G.S.M.N.P. Seed rain peaks during

the fall and again during late spring, with the highest diversity being found in the beech gap. Seeds of yellow birch and red spruce are the predominant species dispersing across the defined boundary between the plant communities. Most noticeable in the seed bank is the lack of viable seeds from most of the woody plants present in the vegetation. The reduced density of red spruce seed rain into the beech gap helps explain the lack of invasion of spruce into the beech gap. From the data, inferences can be made as to the role seed rain and banks play in vegetation recovery by secondary succession after a disturbance.

(304)

The Role of Seed Bank Germinants in Succession Occurring in a Riparian Ecosystem at Cove Lake, Caryville, Tennessee

Wanda Manek

University of Tennessee

Germinants from the seed bank were examined from a small impoundment, Cove Lake, in Caryville, Tennessee. The seed bank was sampled at different topographical areas on the floodplain which varied in flood duration and frequency. Seed bank samples were placed into flats and allowed to germinate in a greenhouse from March 1980 through November 1980. Relative frequency, density and basal areas were determined for overstory vegetation and relative frequency for understory saplings and herbaceous vegetation was determined. Germinant and standing vegetation data sets were analyzed in order to test the following hypotheses: (1) Similarity in number and species composition between standing vegetation and germinant bank decreases at late successional seres; (2) The composition of the germinant bank at a sample site varies in species frequency and diversity at different depths of alluvial deposition; and (3) Species distributions within standing vegetation and seed bank communities occur along a moisture gradient.

(305)

Fly-mediated Spore Dispersal in *Splachnum ampullaceum* (Musc)

Randall G. Cameron and David Troilo

University of Georgia and
City College of New York

Insects visiting a small, natural population of *Splachnum ampullaceum* consisted mostly of two taxa of the family Muscidae. Members of the families Calliphoridae, Cepsidae, Syrphidae, and Anthomyidae were also captured. On the most abundant Muscid, *Pyrellia cyanicolor*, spores were located on the front and midleg. Contact with spores occurred when the flies moved from sporophyte to sporophyte along the upper surfaces of the apophyses. Scanning electron microscopy revealed an amorphous substance often located between the spores and their point of attachment to body of the insect. The mechanism of attraction apparently consists of two components: a long-distance (volatile compounds produced by the sporophytes) and a short-distance (brightly pigmented

apophyses) component. Observations of the behaviors exhibited by the insects while on the sporophytes indicate that no food reward was being obtained.

(306)

The Effects of Vegetation Height and Density on Biomass Allocation in Field Herb Populations

Richard T. Busing and Edward E. C. Clebsch

University of Tennessee

Biomass allocation to leaf, stem, belowground, and sexual reproductive parts was determined for eleven herbaceous plant species occurring in adjacent fields of different vegetational stand height and total plant density at Tall Timbers Research Station, Leon Co., Florida. Intraspecific and interspecific comparisons of component organ dry weight ratios (organ wt./total plant wt.) at peak flowering revealed the following trends: 1) allocation to sexual reproductive parts was low in fields with tall, dense vegetation; 2) allocation to stem tissues was high in tall, dense vegetation; 3) allocation to leaf material was low in fields with tall, dense vegetation; 4) allocation to belowground organs remained relatively constant among the annual species despite differences in vegetation height and density. High stem allocation, characteristic of herbs shaded by other herbs of similar stature, results in low allocation ratios for other aboveground parts. The evidence suggests that allocation patterns in these field herbs are determined primarily by the availability of light.

(307)

Effects of Shading on the Growth of Seedlings of Bald Cypress (*Taxodium distichum* L. Rich.) and Pond Cypress (*Taxodium ascendens* Brong.)

Howard S. Neufeld

University of Georgia

Seedlings of Bald Cypress and Pond Cypress were grown outside for 117 days under 5 levels of irradiance, ranging from 5% to 100% sunlight. Cumulative height growth was greatest under 25% sunlight and least under 5% sunlight for both taxa. However cumulative diameter growth was greatest under 75% sunlight for Bald Cypress, and 100% sunlight for Pond Cypress, and least under 5% sunlight for both taxa. Except 100% sunlight, cumulative height and diameter growth was greater in Bald Cypress than Pond Cypress. Leaf areas peaked under 75% sunlight and were lowest under 100% sunlight for Bald Cypress, and 50% sunlight for Pond Cypress. Bald Cypress leaf areas were approximately twice those of Pond Cypress under all light levels. Leaf weights were also greater. Leaf weight to area ratios decreased with decreasing light levels and were consistently higher for Pond Cypress except under 5% sunlight. From these data, and other data on leaf form, photosynthesis rates and transpiration rates, it is concluded that these taxa are genetically distinct and that very low light levels affect Pond Cypress seedlings more adversely than Bald Cypress seedlings.

(308)

Flooding Effects on Survival and Growth Rates of *Ludwigia leptocarpa* (Onagraceae) at Four Growth Stages

Cheryl A. McCaffrey

Savannah River Ecology Laboratory and
University of Georgia

Some disturbed marshes of the Savannah River Plant (Aiken, S.C.) have irregular periodicities and depths of flooding. In these areas aquatic herbs, including *Ludwigia leptocarpa*, are common on nearly exposed substrate but are generally absent in areas having greater than five cm of water. Controlled experiments were conducted to examine effects of flooding on *Ludwigia leptocarpa* at four growth stages: newly germinated ($\bar{x}$ height = 2.5 mm), juvenile ($\bar{x}$ height = 3 cm), pre-reproductive ($\bar{x}$ height = 13 cm), and reproductive ($\bar{x}$ height = 50 cm). Each stage was subjected to three depths of flooding (0, 2, and 14 cm). Differences in survival, growth rate, and production of aerenchyma and adventitious roots were observed among all growth stages under each flooding treatment. These differences will be compared and related to the ecological position of this species in the marsh.

(309)

Environmental Pollution and Variations in *Platanus occidentalis* L.

G. K. Sharma and Christy Cooper

University of Tennessee at Martin

Platanus occidentalis L. (American sycamore) is one of the largest trees of eastern deciduous forest of U.S.A. It is cultivated and is naturally found in a wide variety of habitats in Tennessee and hence was selected as a plant species for studying the effects of varying degrees of environmental pollution. Several populations of the plant in Memphis, Nashville, and Reelfoot Lake, Tennessee were collected and studied for morphological and cuticular features. In addition, five populations were collected from St. Louis, Missouri. Leaf length and width, petiole length, internode length, fruit weight, and fruit diameter were recorded. Cuticular data recorded included: stomatal size and frequency, stomatal index, trichome length, type and frequency, epidermal wall undulations, and subsidiary cell complex. Statistical analysis of the data indicated the constancy of some features while most were indicative of the varying degrees of environmental pollution.

(310)

Photosynthetic Dynamics of *Fragaria virginiana* and Carbon Gain

Louis J. Gross

University of Tennessee

The light environment of a plant microsite can be highly dynamic, with sunflecks lasting from seconds to minutes in length. Whole leaf photosynthetic response to such variations is complex and species-specific. A mathematical model based on a single enzyme pool is derived to mimic leaf response in varying light and used to analyze carbon gain in *Fragaria virgini-*

ana, the common wild strawberry of the Eastern U.S. I find that sunflecks can be responsible for an appreciable proportion of leaf carbon gain throughout a day, especially under the light-limited conditions common to *F. virginiana*. The manner in which quantum flux is apportioned in sunflecks also affects carbon gain. Model results indicate that the standard methods of estimating carbon uptake in varying light using steady-state photosynthetic rates often give overestimates.

(311)

Ecophysiology of Secondary Dormancy in Seeds of *Ambrosia artemisiifolia* (Compositae)

Jerry M. Baskin and Carol C. Baskin

University of Kentucky

Buried seeds of *Ambrosia artemisiifolia* showed similar germination responses as they came out of primary and secondary dormancy. In early spring at simulated habitat temperatures, seeds germinated well in light but not in darkness, but they germinated well in darkness at temperatures characteristic of the habitat in late spring and summer. By late spring, seeds had entered secondary dormancy and did not germinate at any temperature in light or darkness. Prolonged exposure to 5°C in darkness did not decrease germination in either light or darkness at 30/15°C, but seeds subsequently kept at 15/6°C in darkness for 1 mo required light for germination. Seeds then lost the ability to germinate in light as they were exposed sequentially to 20/10, 25/15, and 30/15°C in darkness. Thus, in spring induction of secondary dormancy of seeds in darkness occurs in two physiological stages. While buried seeds are at low marginal temperatures for germination they lose the ability to germinate in darkness, and then at higher temperatures they lose the ability to germinate in light.

(312)

Transpiration in Native Tropical Forests and Tropical Forests Converted to Pine

Jeffrey C. Luvall, Christopher Uhl,
and Carl F. Jordan

University of Georgia

Studies at the Coweeta Hydrologic Laboratory have shown that water yield of drainage streams decreases when native hardwood forests are converted to pine. Presumably this is because pines transpire for a greater proportion of the year than do the native hardwoods. At the present time, many forests in tropical America are being converted to pine. The effect of this conversion on the water budget is unknown. Effects could be important if the drainage from the forest feeds a reservoir. In this report, preliminary results are given on the effect of conversion of native forest to pine in watersheds feeding the reservoir of San Juan, Puerto Rico. Transpiration rates in native hardwoods and the pines which replace them are being determined by the tritium injection method. In areas where moisture is not a limiting factor, such as the Luquillo Forest in Puerto Rico, transpiration is proportional to sapwood area, regardless of species. Total forest transpiration is determined by injecting tritium in several trees of

each size class, measuring the sapwood of these trees, and then extrapolating to the entire forest.

(313)

Vegetation Dynamics in Forests of Glacier National Park, Montana

Albert J. Parker

University of Georgia

Three forest types are identified by ordination techniques in Glacier National Park, Montana: redcedar/hemlock, ponderosa/Douglas-fir, and lodgepole/larch forests. Trends of relative density across size-class spectra suggest that each forest type possesses unique species dynamics patterns, which are explained by lo-

cal variation in moisture availability and associated disturbance regime. While redcedar/hemlock and ponderosa/Douglas-fir forests exhibit typical successional patterns, the stability of the pioneer dominated lodgepole/larch forests contradicts traditional wisdom. These forests, which occupy dry-mesic sites, experience relatively high frequency canopy fires which appear to be triggered by episodic infestation of mountain pine beetle. Prior interpretations of successional processes in forests of the Pacific Northwest, wherein pioneer forests are considered transient features being transformed into stable forests composed of tolerant species, should be amended to reflect the widespread dominance and persistence of pioneer elements on sites frequently disturbed by canopy fire and pest infestation.

AUTHOR INDEX FOR PAPER/ABSTRACT NUMBER

- Abbott, D. O.—28
 Abraham, B. J.—87
 Amos, M.—15
 Amundsen, C. C.—301
 Anderson, A. D.—36
 Anderson, R. C.—37, 162, 163
 Araya, H. J.—262
 Ash, A. N.—89, 92, 230
 Askew, G. R.—286
 Atchue, J. A. III—294
 Avent, R. K.—56
 Balsano, J. S.—119
 Bandle, B. J.—296
 Barden, L. S.—236
 Barstow, W. E.—281
 Baskin, C. C.—311
 Baskin, J. M.—311
 Bates, V. M. Jr.—205
 Bauman, T. R.—14
 Baumgardner, G. D.—96
 Baylor, N.—32
 Beaudreau, G. M.—23
 Beckmann, R. L.—217
 Bell, C. R.—164, 165
 Bell, J. M.—191
 Benner, D. B.—177
 Benson, K. B.—100
 Bentley, J.—25
 Billingsley, S. J.—28
 Bishop, T. D.—251
 Blasing, T. J.—10
 Bogitsh, B. J.—220, 221
 Booker, J.—277
 Booker, O. J.—75
 Boring, L. R.—300
 Bortone, S. A.—121
 Bowden, S. T.—197
 Bowen, S. J.—13
 Bowers, F. D.—45
 Box, E. O.—290
 Brack-Hanes, S. D.—42
 Bradley, C. F.—280
 Bradshaw, H. D.—284
 Branstetter, S.—58
 Brinson, M. M.—284
 Brown, L.—85, 86
 Brown, R. D.—93
 Brown, S.—245
 Browne, E. T. Jr.—205
 Bryan, C. F.—77
 Buckner, R.—53
 Burnham, K. D.—278
 Bushey, C. L.—240
 Busing, R. T.—306
 Butts, J. A.—223
 Cairns, J. Jr.—112, 242, 256
 Caldwell, S. D.—253
 Calkins, J.—106
 Camburn, K. E.—48
 Cameron, R. G.—305
 Campbell, A. J. J. N.—234
 Capouya, E. R.—31
 Carmichael, G. J.—65
 Carter, J. C.—103
 Carter, M. E. B.—153
 Cate, M.—252
 Chaffee, D.—255
 Champman, R.—53
 Cherry, D. S.—112, 242, 256
 Christiansen, T. A.—289
 Clamp, J. C.—187
 Clark, D. R.—180, 246
 Clark, J. R.—112
 Clebsch, E. E. C.—303, 306
 Collard, S.—57
 Collier, P. A.—171, 188
 Cooper, A. W.—Ecosyst. Symp.
 Cooper, C.—309
 Cooper, C. M.—110
 Corkran, J. L.—38
 Cornwell, G. C.—93
 Courtenay, W. R. Jr.—63
 Crampton, C.—61
 Cranfill, R.—40, 209
 Credle, W. C.—44, 203
 Creek, R. O.—199
 Cropper, W. P. Jr.—200
 Current, W. L.—74, 75
 Currie, P. A.—23
 Curtis, J. D.—137

- Daniel, J. C. Jr.—173
 Daniel, R. E.—28
 Davenport, L. J.—141
 Davis, D.—123
 Davis, D. A.—176
 Davis, D. G.—83
 Davis, K. B.—19, 20
 Day, F. P. Jr.—293, 294, 295, 296, 299
 DeChant, T. F.—70
 Deegan, L.—68
 de la Cruz, A. A.—285, 291
 Delcourt, H. R.—Ecosyst. Symp., 237
 Delcourt, P. A.—Ecosyst. Symp., 237
 DeMont, D. J.—77
 DeSelm, H. R.—238
 Dimock, R. V. Jr.—183
 Dindo, J.—277
 Dodd, C. K. Jr.—182, 269
 Doolittle, B.—111
 Douglass, C. C.—44, 203, 206
 Drysdale, D. T.—120, 121
 DuBay, D. T.—154
 Dundee, D.—107, 250
 Dunlap, J. R.—25, 26
 Dunn, B. A.—297
 Duvick, D. N.—7

 Echternacht, A. C.—272
 Egar, M. W.—178
 El-Banna, A. A.—173
 Eldridge, L.—125, 126
 Ensor, M.—33
 Evans, P. T.—170

 Fairey, J. E. III—44, 203
 Farmer, J. M.—166
 Farrell, M. P.—105
 Faulkner, S. P.—283, 285
 Feldkamp, S. M.—302
 Finucane, J.—60
 Fitzmayer, K. M.—185
 Fleming, D. O.—35
 Foreman, C. W.—18
 Forks, T. P.—273
 Foster, L. A.—220
 Fox, T. H.—179
 Frame, D.—159
 Franke, R. G.—279
 Frazer, N. B.—267
 Frederick, L.—47
 Fridell, J.—268
 Geiger, J. G.—185
 Giardina, R.—107
 Giebel, P. E.—148
 Gowan, D. W.—90
 Greeley, M. S.—62
 Gregg, K. B.—159, 160
 Grenier, M.—85
 Grindstaff, S.—71
 Gross, L. J.—310

 Hackney, C. T.—251
 Haehnle, G. G.—297
 Hahn, D. B.—93
 Halcomb, G. L.—102
 Hall, J. F.—283
 Hames, C. G.—23
 Hamlett, W. C.—174
 Hanley, R. W.—249

 Hardman, C. H.—116
 Harris, J. B.—195
 Harrison, F. W.—175, 176
 Haug, J. L.—37
 Hawks, G. G.—12
 Hehr, J. G.—12
 Heikkinen, H. J.—1
 Heins, D. C.—123
 Helseth, E. A.—281
 Hemingway, L. P.—252
 Henwood, A. T.—266
 Henzler, D. J.—169
 Herr, J. M. Jr.—150, 168
 Hillier, D.—276
 Hinkle, C. R.—Ecosyst. Symp.
 Horn, C. N.—218
 Hornick, F. R.—222
 Horton, J. H.—231
 Huang, F. H.—194
 Huck, R. B.—151
 Hudson, J. S.—174
 Hughes, K. W.—171
 Hupp, C. R.—6

 Innes, N. F.—259
 Ireland, A. P. H.—261

 Jeffreys, D. B.—252
 Jenner, C. E.—179
 Johnson, S.—226
 Jones, A. S.—15
 Jones, J. D.—286
 Jones, L. M.—129
 Jones, L. W.—171, 188
 Jones, R. L.—211
 Jones, Ron L.—239
 Jones, S. B. Jr.—135, 210, 216
 Jones, S. M.—297, 298
 Jordan, C. F.—312
 Joyce, J. T.—51

 Kalinsky, R. G.—109
 Kane, B. E. Jr.—252
 Kasso, W. B.—22
 Keeley, S. C.—216
 Keller, H. W.—54
 Kelly, J. J.—29
 Kimbrough, T. D.—189
 King, B. L.—135
 Kitchings, J. T.—95
 Kivic, P. A.—26
 Knight, L. A. Jr.—21, 110
 Koch, W. J.—282
 Koenig, D.—39
 Kowalczyk, B. F.—147, 150
 Kuivinen, K. C.—4

 LaFrankie, J. V. Jr.—161
 Lane, D. M.—219
 Larson, G. L.—113, 114, 115
 LaSalle, M. W.—254
 Lassetter, S.—145
 Lawson, M. P.—4
 Lechleitner, R. A.—256
 Lersten, N. R.—137
 Leung, T.-S.—248
 Levine, S. J.—68
 Lewis, J.—36
 Lewis, T. C.—59

Liberta, A. E.—37
 Lindahl, R.—31
 Lindquist, D. G.—66, 128, 129, 130
 Lindsay, D. S.—225
 Lindsey, A. H.—164, 165
 Littrell, J. W.—104
 Llewellyn, G. C.—15
 Lowrance, J. H.—76
 Lutz, P. E.—181
 Luvall, J. C.—312
 Lynn, D. G.—192

MacCormack, A.—84
 MacGregor, R. III—60, 62
 MacLeish, N. F.—144
 Maddock, M. B.—30
 Mainwaring, H. R.—51
 Major, V.—78, 79
 Mamaril, A.—186
 Manek, W. B.—304
 Mansberg, L.—156, 287
 Marion, K. R.—263, 264, 271
 Martin, W. H.—235
 Mathews, R. C. Jr.—114
 Mathis, G.—224
 Matthews, J. F.—215
 Mattis, T. E.—73
 McCaffrey, C. A.—308
 McCann, J. A.—63
 McCauley, D. E.—81, 85
 McClung, R. M.—181
 McClurkin, I. T.—21
 McCord, R. A.—301
 McCracken, G. F.—80
 McCredie, J.—178
 McDonald, C. B.—230
 McDougald, L. R.—224
 McKinney, R. B.—271
 McLeod, K. W.—288, 292
 McPherson, R. J.—263, 264
 McRae, D. D.—9
 Meigs, R. A.—213
 Mellichamp, T. L.—214
 Menhinick, E. F.—259
 Mettee, M. F.—67, 258
 Miksa, A. K.—21
 Miksche, J. P.—195
 Miller, G. C.—228
 Miller, G. L.—117, 118
 Miller, W. R. III—243
 Milling, D. M.—30
 Mitchell, J. C.—265, 274
 Mobley, R. W.—228
 Monaco, P. L.—119
 Monk, C. D.—300
 Montain, C. R.—193
 Moody, M. D.—51
 Moore, S. E.—115
 Morris, W.—255
 Moschler, B.—2, 8
 Mueller, G. M.—55
 Murdy, W. H.—153, 154, 155

Naqvi, N. Z.—248
 Naqvi, S. M.—248
 Nelson, C. H.—257
 Nelson, D. H.—260
 Nesom, G. L.—136, 212
 Neufeld, H. S.—307

Nicholson, R. B.—112
 Nordlie, F. G.—249

Odebode, A. C.—47
 O'Dillon, A. C. J.—253
 Olewine, D. A.—23
 O'Neil, P. E.—67, 258
 O'Quinn, R.—108
 Orbach, D.—152
 Ott, J.—81

Parker, A. J.—313
 Parker, K. C.—91
 Passingham, H.—268
 Patton, S.—227
 Pav, D. I.—172, 262
 Pavlovic, N. B.—303
 Pennington, C. H.—105
 Perkins, B. E.—238
 Perry, J. E.—299
 Petersen, R. L.—46, 47
 Peterson, C.—268
 Phipps, R. L.—5
 Pilatowski, R. E.—149
 Pinder, J. E. III—289
 Pittillo, J. D.—232, 233
 Pocratsky, L. A.—24
 Polovino, H. N.—105
 Porcher, R. D.—201, 202
 Porter, P.—140
 Price, J. O.—247
 Puckett, L. J.—3
 Purdom, D. T.—23

Rabinowitz, A.—78, 79
 Ragsdale, H. L.—200
 Ralston, F. L.—50
 Ramsey, J. S.—124
 Rasch, E. M.—119
 Renzaglia, K. S.—43
 Reynolds, J. D.—148, 189
 Ridley, B.—115
 Riopel, J. L.—192
 Robertson, J. L.—172, 262
 Romme, W. H.—235
 Rosa-Molinar, E.—57
 Rosso, S. W.—273
 Rupert, E. A.—170
 Rushton, P. S.—16, 17

Sandoval, M.—198
 Sargeant, F. X.—30
 Schaefer, V. G.—195
 Scheiring, J. F.—83, 102, 104
 Scholtens, R. G.—226
 Schramm, J.—72
 Schrum, D. C.—223
 Schwartz, F. J.—56, 268
 Seagle, S. W.—94, 95
 Sharitz, R. R.—158
 Sharma, G. K.—309
 Sherrod, C. Jr.—292
 Shipway, L.—27
 Shrode, J. B.—69
 Shute, J. R.—66, 128, 129, 130
 Shute, P. W.—66, 128, 129, 130
 Siegel, M.—53
 Siegfried, B.—86

- Silsbee, D. G.—113
 Simco, B. A.—19, 20
 Singer, M.—178
 Smathers, G. A.—231, 232, 233
 Smith, G. L.—143
 Smith, H. E.—167
 Smith, M.—167
 Snelson, F. F. Jr.—122
 Solomon, A. M.—237
 Stahle, D. W.—12
 Stair, D. M. Jr.—244
 Stalter, R.—229
 Steffens, J. C.—192
 Stetler, D. A.—242, 256
 Stiles, R.—125
 Stout, J. P.—291
 Strand, R. H.—105
 Stringham, S. F.—99
 Stuart, J.—147
 Stucky, J. M.—217
 Stutts, J. G.—146
 Sullivan, J. H.—41, 232
 Summers, B.—17
 Sutter, R.—156
 Swank, W. T.—300
 Swindler, G.—107, 250
 Swindoll, C. M.—131

 Tabatabai, R. N.—16, 17
 Tarter, D. C.—72, 100, 255
 Taylor, J. N.—63
 Teaf, C. M.—59
 Teare, C. A.—83
 Thomas, B. A.—42
 Thompson, B. A.—68
 Thompson, R. L.—142
 Thye, C. C.—74
 Tietjen, W. J.—88
 Tietjen, W. L.—103
 Tolbert, V. R.—244
 Toman, F. R.—198
 Tomasso, J. R.—20
 Torrance, P.—19
 Trauth, S. E.—117
 Travis, J. C.—27
 Troilo, D.—305
 Tryba, S. E.—196
 Tuggle, S. T.—23

 Uhl, C.—312
 Ultsch, G. R.—249
 Utter, P. S.—124

 Van Den Avyle, M. J.—185
 Van Horn, G. S.—208
 Van Lear, D. H.—298
 Varney, D. R.—53
 Vaughan, G. L.—244

 Veerasethakul, S.—145
 Vidrine, M. F.—180, 184
 Vitt, A. L. J.—270
 Vredeveld, G.—36

 Wade, J.—272
 Wall, W. E.—275
 Wallace, A. R. K. Jr.—132
 Wallace, J. W.—41, 138, 139, 140
 Walne, P. L.—24, 25, 26, 50
 Ward, B.—39
 Warren, M. L. Jr.—64
 Washburn, K. W.—13
 Watson, F. D.—133
 Weber, R. M.—134
 Weekly, B.—189
 Weiss, T. E. Jr.—157
 Wells, M. R.—22
 Werth, C. R.—212
 West, D. C.—10
 West, J. L.—70, 71
 West, L. K.—25
 Whedbee, E. D.—92
 Whigham, A. D. F.—152
 Whipple, S. A.—161
 Whitaker, J. B.—242
 White, C. M.—276
 White, D. R.—274
 White, M. T.—23
 White, P. S.—207, 239
 Whitford, L. A.—49
 Whitney, K. D.—54
 Wickland, D. E.—287
 Wickstrom, C. E.—38, 101
 Wickstrom, G. C.—101
 Wieland, W.—127
 Wiersema, J. H.—204
 Williams, A. L.—32, 33, 34
 Williams, C. S.—57
 Williams, J. S.—117, 118
 Williams, T. M.—286
 Wilson, D.—258
 Winstead, J. E.—82
 Wolf, F. T.—52
 Woods, F. W.—2, 8
 Woolcott, W. S.—274
 Wooten, J.—268
 Workman, S. W.—288
 Wourms, J. P.—174
 Wust, C. J.—50

 Yates, F. K.—293
 Yeany, R. H.—281
 Yopp, J. H.—196
 Young, M. L.—241
 Young, R. A.—196

 Zeckmeister, M. T.—190

ASB CANDIDATES FOR OFFICE — 1981

The Nominating Committee, composed of Edward E. C. Clebsch, Robert B. Short, and Chairman R. O. Flagg, has selected the following slate of nominees for the ASB offices to be filled this year. Additional nominations may be made from the floor. Voting will take place at the Annual Business Meeting, Friday, April 10.

President-Elect:—**Beryl C. Franklin**, Northeast Louisiana University
—**Margaret L. Gilbert**, Florida Southern College

Vice-President:—**Gerald W. Esch**, Wake Forest University
—**Donald J. Shure**, Emory University

Executive Comm.:—**Lafayette Frederick**, Howard University
(two positions) —**Charles E. Jenner**, Univ. North Carolina, Chapel Hill
—**Sharon Patton**, Univ. Tennessee, Knoxville
—**J. Kenneth Shull, Jr.**, Loyola Univ., New Orleans

Beryl C. Franklin

(President-Elect)

Educated at Kentucky Wesleyan College, the University of Kentucky, and the Ohio State University, Dr. Franklin has been a member of the faculty at **Northeast Louisiana University**, where he is currently Professor of Biology, since 1959. His research interests are in mammalian reproductive physiology, and he is the author of several papers in this field. A member of several professional societies, including the

American Society of Zoologists, he was President of the Louisiana Academy of Science in 1967–68. At present, he is a member of the Adjunct Faculty of the Center on Aging at Northeast Louisiana University and has developed a course on the Biology of Aging (a graduate course for those non-biologists working toward a certificate in Gerontology).

Dr. Franklin has served ASB as Chairman of the Travel Awards Committee in 1973–74. He has served on the Executive Committee of ASB (1975–78) and as Vice-President (1978–79) where he was active in securing patron memberships in the Association. He has also served the Northeast Louisiana Sigma Xi Club as delegate to the annual meeting for eight years.



Margaret L. Gilbert

(President-Elect)

Dr. Gilbert is Professor of Biology and Chairman of the Biology Department and of the Division of Natural Sciences and Mathematics at **Florida Southern College**. She received the B.S. degree from the University of Rhode Island and the Ph.D. degree from the University of Wisconsin, Madison, under J. T. Curtis in the continuum-ordination days. She then did a 'locum' as Visiting Assistant Professor at Northwestern State University, Natchitoches, Louisiana for a year before coming to Florida.

Her current research interests are in applied plant ecology, and she does some consulting, and has co-operated in the National Landmark program. She is active in the American Association of University Women and served on the national committee on science and currently is state chairman for Education. Dr. Gilbert served on the board of the Polk Public Museum, particularly consulting for scientific exhibits and was Vice-President in 1977–78. She was President



of the Florida Academy of Sciences in 1966 and program chairman in 1977–80. She is an AAAS Fellow and also was appointed a Danforth Fellow in 1976. She has served the ASB as Secretary in 1970–73 and Vice-President in 1980–81. She was awarded the Meritorious Teaching Award in 1977, and served on that committee 1977–1980.

Gerald W. Esch

(Vice-President)

Gerald W. Esch is Professor and Chairman, Department of Biology, Wake Forest University, Winston-Salem, North Carolina. He received the B.A. degree from Colorado College and the M.S. and Ph.D. degrees from the University of Oklahoma. From 1963–1965, he was an NIH Postdoctoral Trainee in Parasitology at UNC–Chapel Hill. Since 1965, he has been associated with the Department of Biology at Wake Forest, becoming Chairman in 1975 and Professor in 1976. During the summers from 1965 through 1974, he was Visiting Professor of Parasitology at the W. K. Kellogg Biological Station of Michigan State University. During 1971–1972, Dr. Esch was a World Health Organization Fellow at the Imperial College of Science and Technology of the University of London. In 1974–1975, he was a Research Associate at the Savannah River Ecology Laboratory.

Dr. Esch is the author or co-author of more than 50 publications. He was co-editor of *Thermal Ecology* II, which includes a series of papers from a symposium

sponsored by the Savannah River Ecology Laboratory in 1974. He also is the editor of *Regulation of Parasite Populations*, published in 1974. He is currently serving terms on the editorial boards of the *American Midland Naturalist* and the *Proceedings of the Helminthological Society of Washington*.

Dr. Esch is a member of ASB, AIBS, the South-eastern Society of Parasitologists (Vice-President and Programs Officer, 1974; President, 1976), American Society of Parasitologists (Nominating Committee, 1979), British Society of Parasitologists, Ecological Society of America, Helminthological Society of Washington, and the American Microscopical Society (Associate Secretary, 1973; Secretary, 1974–1979). He has been a member of ASB since 1965 and has served a term on the Place-of-Meeting Committee.

Donald J. Shure

(Vice-President)

Donald J. Shure is Associate Professor and Director of Graduate Studies in the Biology Department at Emory University. He received the B.A. (1961) from Western Maryland College and the M.S. (1966) and Ph.D. (1969) degrees from Rutgers University. His research interests in ecology include succession, plant-animal interactions and perturbation effects on ecosystem processes. Research areas have included granite outcrops, Copperhill, Tennessee and floodplain forests at the Savannah River Plant. Dr. Shure has published numerous papers in the field of ecology and he has directed the research of 15 graduate students.

Dr. Shure served as the first chairman of the South-eastern Chapter of the Ecological Society of America from 1976–78 and coordinated several activities with ASB and AIBS in that capacity. He has also served on the Membership and Study Committees of the Ecological Society and is currently chairing the Study Committee of ESA. He was an ESA Council Member from 1976–78. Dr. Shure is on the Board of Trustees of the Highlands Biological Foundation and serves on the Board of Directors of the Highlands Biological Station. He is for this year (1980–81) a member of the Executive Committee of ASB.

Lafayette Frederick

(Executive Committee)

Professor of Botany and Chairman of the Department of Botany at Howard University, Dr. Frederick received the B.S. degree (1943) from Tuskegee Institute, the M.S. degree (1950) from the University of Rhode Island, and the Ph.D. degree (1952) from Washington State University. He has been at Howard University since 1976. From 1962 to 1976, Dr. Frederick was Professor and Chairman of the Department of

Biology at Atlanta University. From 1952 to 1962 he held professorships in the Department of Biology at Southern University in Baton Rouge, La. Dr. Frederick has also held appointments as an NSF Science Faculty Fellow (1960-61) in the Department of Botany at the University of Illinois and a Visiting Research Associate (Spring 1975) in the Department of Microbiology at the University of Georgia.

Dr. Frederick's research interests have involved studies on ascospore wall development of fungi in the family Sordariaceae, systematics and spore development, setulaceous-spored pycnidial fungi, the systematics and ecology of myxomycetes, and host-parasite interactions in the Dutch elm disease. He has served as a member of the Commission on Undergraduate Education in the Biological Sciences, as a member and as chairman of the General Research Support Program Advisory Committee of the National Institutes of Health, and as a member and chairman of the Biology Achievement Test Development Committee of the College Entrance Examination Board.

Dr. Frederick is a member of the ASB, the Georgia Academy of Sciences, the Mycological Society of America, the Botanical Society of America, the American Phytopathological Society, the Southern Appalachian Botanical Club, AAAS, AIBS, Phi Kappa Phi, Beta Beta Beta, Phi Sigma, and Sigma Xi. He serves as the representative of ASB to AAAS, Section G.

Charles E. Jenner

(Executive Committee)

Dr. Jenner received the A.B. (1941) degree from Central College (Fayette, Missouri) and the M.A. (1949) and Ph.D. (1951) degrees from Harvard University. He has been on the faculty of the Department of Zoology at the University of North Carolina at Chapel Hill since 1950, serving as Chairman from 1957 to 1962. He also taught the Marine Ecology course at the Marine Biological Laboratory in Woods Hole from 1952 to 1956 and taught the Invertebrate Zoology course there in 1961.

Dr. Jenner is a member of the American Society of Limnology and Oceanography, the Atlantic Estuarine Research Society, the American Society of Zoologists, the Western Society of Naturalists, the Marine Biological Laboratory Corporation, and other professional organizations. He has belonged to ASB for many years and has served two 3-year terms on the Awards Committee. He currently is on the Board of Trustees of the Highlands Biological Foundation and the Board of Directors of the North Carolina Academy of Science. He is Chairman of the Academy's Public Affairs and Policy Committee and recently was appointed to organize an Academy program promoting more interdisciplinary courses in North Carolina colleges and universities about the related problems of population,

resources, and environment. He has served on the State of North Carolina's Natural History Museum Endangered Species Committee and on the Chapel Hill, North Carolina citizen task force assessing the effect of the Shearon Harris Nuclear Plant on Chapel Hill.

Dr. Jenner has general research interest in the biology of marine and freshwater invertebrates, with particular interest in environmental control of seasonal biological events (photoperiodism), Odonata, commensal bivalve molluscs, the marine snail *Ilyanassa obsoleta*, the protobranch bivalve *Solemya velum*, and the marine mudshrimp *Upogebia*.

Sharon Patton

(Executive Committee)

Dr. Patton is Assistant Professor of Parasitology in the Department of Pathobiology at the University of Tennessee College of Veterinary Medicine. She received the B.S. degree in Biology from Middle Tennessee State University, and the M.S. degree in Zoology and the Ph.D. degree in Parasitology from the Thomas Hunt Morgan School of Biological Sciences at the University of Kentucky. Before returning to Tennessee she was a post-doctoral scholar with Dr. J. H. Drudge in the Veterinary Science Department at the University of Kentucky.

Dr. Patton's research interests center around worms (specifically veterinary helminthology). She has studied the host-parasite relationship as it involves the immune response, epidemiology, as well as general life cycles of helminths. She is also interested in parasites of exotic animals.

Dr. Patton is at present President-Elect of the Southeastern Society of Parasitologists. She has been a member of ASB since 1973. She is a member of several other scientific societies including the American Society of Parasitologists, American Association of Veterinary Parasitologists, Sigma Xi, Tennessee Academy of Science, Helminthological Society of Washington, American Society of Tropical Medicine and Hygiene, Wildlife Disease Association, and AAAS.

J. Kenneth Shull

(Executive Committee)

Dr. Kenneth Shull, a native of Anniston, Alabama, earned a B.S. in chemistry from the University of Alabama in 1963 and in 1967 he received an M.S. in biology from the same institution. He earned a Ph.D. in genetics from Florida State University in 1973 where he was a recipient of an NIH Genetics Fellowship as well as research and teaching assistantships. He has worked as an electron microscopist in parasitology.

tology and is currently an Associate Professor of Biology at Loyola University, New Orleans, where he has been since 1973.

Dr. Shull's research interests are in the area of chromosome homology, nuclear cytology during meiosis, and the cytotaxonomy of the genus *Lilium*. He serves as the pre-dental adviser at Loyola, is on the faculty Development Committee and is a member of the Loyola Speaker's Bureau. He serves on the Committee for Protection of Human Subjects at Xavier University

and has participated in the Southeastern Seminar Circuit. As a member of ASB since 1970, Dr. Shull has chaired the 1978 Travel Awards Committee and the 1981 Research Award Committee and is co-organizer of the 1981 Genetics Symposium to be held at the Knoxville meeting. Dr. Shull is also a member of the Genetics Society of America, the Genetics Society of Canada, AAAS, Sigma Xi, and the Lily Society of America.

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE

The University of Alabama in Huntsville, Department of Biology. Dr. Harold J. Wilson, Associate Professor and Chairman of Biology, is on sabbatical leave at the University of Illinois, Department of Plant Pathology, carrying out research in Dr. Robert Goodman's laboratory on the nuclear translocation of viral DNA. Dr. Curtis Adams, Professor of Biology, was recently awarded the UAH Alumni Faculty Appreciation Award. Dr. P. Samuel Campbell, Associate Professor of Biology is serving as Acting Chairman for 1980/81. Dr. George T. Dimopoulos has been appointed the new Dean of Science and Engineering and Professor of Biology. He was formerly Chairman of the Department at Wright State University. His area of research is immunology, and he has published over 100 papers in his field. Dr. Michael H. Eley was recently promoted to Associate Professor of Biology and has been awarded a grant from DOE Appropriate Technology Office to conduct alternate fuels research. Dr. Robert O. Lawton has been appointed as Assistant Professor of Biology. He recently received a Ph.D. from the University of Chicago, and his area of interest is plant ecology. Dr. Richard F. Modlin, Assistant Professor of Biology, has been awarded a grant from TVA to study the uptake and dispersal of the herbicide 2,4-D and its metabolites after long-term use in aquatic systems. This research is being carried out in conjunction with Dr. J. Milton Harris, Professor of Chemistry.

Eckerd College, Natural Science Collegium. Dr. John Reynolds III has joined the biology faculty. He is a marine vertebrate biologist working primarily with marine mammals. Dr. Reynolds received his Ph.D. in

the School of Marine and Atmospheric Science, University of Miami.

University of Central Florida, Department of Biological Science. Dr. John A. Osborne, Associate Professor, has received EPA funding to conduct research in conjunction with the Florida Game and Fresh Water Fish Commission dealing with the hybrid grass carp in eight Central Florida lakes. The study will determine the efficacy of the carp at controlling submersed vegetation growth, principally *Hydrilla verticillata*. Data will be obtained to establish a stocking model based on vegetation biomass in order to maximize control while minimizing numbers of fish. This study is the largest trial presently underway with the hybrid grass carp in the United States.

Jacksonville University, Division of Science and Math. Dr. A. Quinton White, Assistant Professor of Biology, has been awarded the National Conservation Award by the Daughters of the American Revolution for contribution to Marine Biology education. Dr. Ted T. Allen, Professor of Biology, received the Lee and Mimi Adams Environmental Award, Spring 1980. Dr. Kenneth Relyea, Associate Professor of Biology, will publish his new book, "Inshore Fishes of the Arabian Gulf," in 1981. Dr. John E. Trainer, Jr., Associate Professor of Biology, has been promoted to Dean of Faculties. Dr. Gary J. Court has been appointed Assistant Professor of Biology. His previous position was at Brookhaven National Laboratories.

Atlanta University, Department of Biology. Dr. Rosalyn M. Patterson has been named Acting Chairperson for the Biology Department. Dr. Patterson attended the Second International Congress of Cell Biology in Berlin, August 31 to September 5, 1980.

She presented a paper entitled "Reduction of Benzo(a)pyrene Induced Chromosomal Aberrations by Alpha-tocopherol." **Dr. John Browne** also attended the meeting in Berlin. **Dr. Roy Hunter** was re-elected President of the Beta Kappa Chi Scientific Society for 1980-81 and elected to the Board of Directors of the Atlanta Council of International Programs.

Georgia Southwestern College, Department of Biology. The College announces the retirement of **Professor Charles K. Ewing** after 34 years of faithful service to the department and Georgia Southwestern College. **Dr. Elizabeth Davis (Betty) Elder** has joined the department as an Assistant Professor. She received her Ph.D. from Texas A&M University and teaches anatomy and physiology, microbiology and bacteriology. **Dr. Stanley Elwood (Stan) Trauth** received his Ph.D. from Auburn University and recently joined the department to teach general biology, zoology, herpetology, and parasitology. He is an Assistant Professor. **Dr. William L. Tietjen** and **Dr. Jack C. Carter** have spent a portion of the last academic year doing a study involving the flow of phosphorus in a swamp ecosystem. The study was financed by OWRT and should be completed during the present school term.

University of Southwestern Louisiana, Department of Biology. **Dr. Richard Uznanski** has joined the faculty for the 1980-81 academic year. Dr. Uznanski comes to USL from Notre Dame where he was an NIH Postdoctoral trainee.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. **Dr. J. Sieg** of the University of Osnabruck, a world authority on organisms belonging to the Order Tanaidacea, **Dr. Richard Heard** and **John Ogle**, of the Gulf Coast Research Lab, will participate in a worldwide project to identify and describe many of the more than 1,000 species of tanaidaceans in the next 10 years. Tanaidaceans are believed to play an important role in the world biosphere and are the second most abundant deep-water benthic crustacean group in the Gulf of Mexico. The three investigators will attempt to describe five species each year over the next five years, publishing the descriptions in the GCRL technical journal *Gulf Research Reports*. A key, map and guidebook are also planned. **Dr. Ervin Otvos**, head of the geology section of GCRL spoke at the September meeting of the New Orleans Geological Society. His topic was "Barrier Islands and Hurricanes—Gulf of Mexico." **Dr. Sally Richardson**, associate ichthyologist, has received NSF and Smithsonian Institution funding to perform a study entitled "Systematic Relationships among Northern Cottid Fishes Based on Developmental Osteology of their Larvae." The Board of Trustees of Mississippi Institutions of Higher Learning has approved the formal affiliation of the GCRL with the College of the Ozarks and the University of Kentucky, Lexington. The laboratory will provide training in the marine sciences to students of the colleges.

Mississippi State University, Department of Biological Sciences. **Dr. Janice E. Chambers** attended a special conference sponsored by the Pesticide Division of the American Chemical Society on "The Pesticide Chemist and Modern Toxicology," June 22-27, 1980. Dr. Chambers presented two papers and chaired a technical paper session during the annual meeting of the American Chemical Society in Las Vegas, Nevada. **Dr. Armando A. de la Cruz** attended the meeting of the Advisory Panel of the Natural Resources Conservation Department of Jamaica in Kingston, Jamaica, July 1980. He chaired a plenary session and presented two papers at the Second International Conference on Mangroves and Tropical Shallow Water Communities, Papua, New Guinea. **Robert J. Esher** and **James L. Wolfe** attended the annual meeting of the American Society of Mammalogists, Kingston, Rhode Island. **Dr. Jerome A. Jackson** attended the annual meeting of the American Ornithologists' Union, Fort Collins, Colorado. He was recently elected to a three-year term as a member of the Board of Directors of the Mississippi Academy of Sciences. **Michael J. Sullivan** presented a paper during the Botany 80 meeting of the Phycological Society of America held at the University of British Columbia, Vancouver. **Barbara H. Turner** attended the Mississippi State Society for Medical Technologists meeting June 1980. She was elected president-elect of the MSSMT, secretary for Region III Board of the ASMT, and editor of the *Microscopic Reports*, Newsletter of the MSSMT. **Carol H. Williams** presented a workshop on "Clinical Laboratory Statistics" for the northeast district of the Mississippi State Society for Medical Technologists. **Dr. Robert J. Esher**, mammalogist (Ph.D. Mississippi State University), **Dr. George Kulesza**, vertebrate zoologist (Ph.D. University of Illinois at Urbana) and **Ms. Bette Schardien**, ornithologist and a doctoral candidate at MSU, were appointed temporary assistant professors beginning Fall 1980. **Dr. Jerome A. Jackson** is on sabbatical leave for the 1980-81 academic year, working at the Savannah River National Environmental Research Park, and on the Mississippi Gulf islands. He will also lead a trip to the Amazon basin, the Ecuadorian Andes, and the Galapagos Islands during December and January, 1980-81. **Dr. James L. Wolfe** is on a full-time research appointment at the MSU Research Center located in the National Space Technology Laboratory. **Dr. Glenn H. Clemmer** is also on a one-year leave-of-absence. **Dr. Ronald G. Altig** has returned from a year long leave-of-absence.

St. Mary's College, Science Department. **Dr. Janice C. Coffey** has returned from a Fulbright spent in Elminya, Egypt, and is currently Chairman of the Science Department.

Duke Power Company, Environmental Services Section. **Mark Rash** has joined the Macroinvertebrate Group. **James Hall** has completed a report on the one year study "The Growth of the Asiatic Clam, *Corbicula*, in Lake Norman, N.C." **Tom Wilda** has com-

pleted a summary report on the benthic communities of Lake Norman. Temporal and spatial fluctuations of the dominant taxa and the total benthos were analyzed from data collected in quarterly samples from 1974 through 1978. **Karen Eaton** is conducting a survey of the benthic macroinvertebrates of the Catawba River Reservoirs. The survey will provide distribution data on the Asiatic Clam, *Corbicula*, and a description of the macroinvertebrate communities in nine of the major Catawba River Reservoirs.

St. Andrews Presbyterian College. **Dr. Norman C. Melvin, III** has recently joined the faculty. He has a Ph.D. in Botany from Miami University (Ohio).

East Carolina University, Department of Biology. **Dr. Charles E. Bland**, Professor of Biology is on full released time during the 1980-81 academic year. He is working with Professor **J. N. Couch** of the University of North Carolina at Chapel Hill in the preparation of a book, *The Genus Coelomomyces*. **Dr. Paul M. Ressler** has been appointed Lecturer. Dr. Ressler received his Ph.D. from North Carolina State University. His field of specialization is cytotaxonomy, and he has done post-doctoral research on nitrogen fixation in peanuts at NCSU.

North Carolina State University, Department of Horticultural Science. **Dr. Roy A. Larson** has been named a "Fellow" in the American Society of Horticultural Science for his outstanding contributions to horticultural science. Larson is known worldwide for his research on a variety of floricultural crops, and achievements such as the system he developed for getting azaleas to flower year around. The North Carolina Association of Cooperative Extension Specialists has presented the 1980 "Package Program" award to **Dr. L. George Wilson**. He developed the "Yam Alert" program, a multi-media slide-tape presentation to educate growers about sweet potato seed management on the farm. Dr. Wilson provided additional information to the participating growers through periodic newsletters, pamphlets, and television and radio appearances.

University of Tennessee, Graduate Program in Ecology. **Dr. Gary Sayler**, Associate Professor of Ecology and Microbiology, is believed to be the first ecologist to receive a National Institutes of Health, Research Career Development Award. As a result of this award, during the next five years, Dr. Sayler will be able to expand an already outstanding research program in microbial ecology.

Virginia Commonwealth University, Department of Biology. **Dr. Sara McCowen** has received the Eloise Garrett Fellowship from Sigma Delta Epsilon Graduate Women in Science. **Dr. Leonard Smock** has received funding for a study entitled "Benthic Macroinvertebrate Communities of a Floodplain Creek in the Congaree Swamp National Monument."

Bridgewater College, Department of Biology. **Harry G. M. Jopson**, Professor of Biology, will retire June 1, 1981. Dr. Jopson received his Ph.D. from Cornell

University and joined the staff at Bridgewater in 1936. He served as Chairman from 1950 to 1973.

Union University, Department of Biology. **Dr. Michael L. McMahan** (Ph.D. Louisiana State University) has been appointed an Assistant Professor of Biology. He was formerly associated with Campbellsville College, Kentucky.

College of Charleston, Biology Department. **Don R. Deibel**, Visiting Assistant Professor; **Mary Berry**, Assistant Professor; and **Susan J. Morrison**, Assistant Professor. Dr. Deibel is a graduate of the University of Georgia and has research experience from Skidaway Institute of Oceanography. He is substituting for **Dr. Chris Koenig** who is on a leave of absence. Dr. Berry's research interest is in marine invertebrate embryology (Pycnogonids). She recently completed a developmental investigation as part of her Ph.D. which was awarded by Duke University. Dr. Morrison's background and training in microbial marine biology at Florida State University is timely and of benefit to our programs in marine biology.

ABOUT INSTITUTIONS

University of Miami, Rosenstiel School of Marine and Atmospheric Science. Spiny lobster fishery management in the Caribbean will be one of the topics of the thirty-third annual session of the Gulf and Caribbean Fisheries Institute being held this year in San Jose, Costa Rica, November 9-14. Once a year, the GCFI, founded more than thirty years ago at the University of Miami's Rosenstiel School of Marine and Atmospheric Science, brings together representatives of fishing companies, fish brokers, scientists, environmentalists, and fishery administrators from all over the region. The meetings consist of papers presented, audience discussions, methods workshops, team evaluations and critiques. The *Proceedings* of the meetings are published and sent to registered participants and to members who were unable to attend. *Jim Hignman*, executive director of GCFI, is also editor of the *Proceedings*.

Florida Southern College. Three endowed chairs have been established this year. The first is a gift of the Jessie Ball duPont Religious, Charitable and Educational Fund. It was established in the natural sciences with matching funds completed in September to \$500,000. The Nelson C. White Chair of Life Sciences was established in August 1980 through a gift from International Minerals and Chemical Corp. The third chair was established by Mrs. Ruth A. Tyndall in honor of her late husband, a prominent Florida citrusman until his death last year. This complete chair will be in citrus and subtropical horticulture. These three chairs, all in the Division of Natural Sciences and Mathematics, are the first endowed chairs at the College.

Georgia Southwestern College, Department of Biol-

ogy. The department has recently acquired a new microprojector and the use of 13.4 acres of Federal land located adjacent to the USDA Plant Materials Center in Americus. The land is currently being used by the college as a nature study area for biology classes and as a long-term study area for demonstration of successional changes.

St. Andrews Presbyterian College. The Science Program has received a CAUSE Grant to enable the Biology Program to purchase a scanning electron microscope to complement the transmission electron microscope and to renovate the greenhouse, environmental chambers, and herbarium.

Austin Peay State University, Biology Department. In cooperation with the University of Tennessee at Martin, the department is initiating a new summer program in field biology which will be headquartered at TVA's Land Between the Lakes. Designed as an intensive, live-in, field experience, the inaugural session is scheduled for August 2 through 15, 1981. Two, 4-quarter hour courses (plant taxonomy and ornithology) and a 1-quarter hour seminar, all tailored for upper level undergraduates, graduate students, and elementary and secondary science teachers will be offered. For more information write: Dr. A Floyd Scott, **Director of Summer Field Biology Program, Department of Biology, Austin Peay State University, Clarksville, Tennessee 37040.**

University of Tennessee, Graduate Program in Ecology. The Graduate Program in Ecology now occupies Old Dabney Hall, formerly the Chemistry Building. Newly renovated offices and laboratories support environmental toxicology, microbial ecology, paleoecology, physiological ecology, freshwater and marine ecology.

North Carolina Academy of Science. *The Journal of the Elisha Mitchell Scientific Society* will become the editorial and financial responsibility of the North Carolina Academy of Science on January 1, 1981. The *Journal* will continue to publish refereed papers about original research in all scientific disciplines. The new Editorial Board is considering several additions to the content of the *Journal*; these include summary articles on topics of special interest, reports of North Carolina science news, and commentaries on science and public policy issues. The Academy of Science has passed a policy statement calling for greater commitment by colleges and universities to interdisciplinary teaching about the related global problems of human population growth, resource depletion, and environmental deterioration. To implement this statement, members and officers of the Academy are meeting with North Carolina college presidents and university chancellors, to request that each appoint a committee of interested faculty and students to review current teaching at their institution in these areas and consider ways in which that teaching can be made more effective. Anyone wishing more information should write to Dr. Martha Jenner, NCAS Executive Secretary, or Dr. Charles

Jenner, NCAS Chairman of Public Affairs and Policy, Box 621, Carrboro, North Carolina 27510.

The College of Charleston, Biology Department. The College has expanded its undergraduate Marine Biology Program. Six courses will be offered at the Grice Marine Biological Laboratory (Fort Johnson) during June, July and August. This will include Crustacea, Invertebrate Embryology and Salt Marsh Ecology. Also, a portion of the Grice Marine Biological Laboratory has been refurbished and housing is available for small groups and/or individuals on a by arrangement basis. For further information, contact the Department of Biology (803) 792-5504.

ABOUT MUSEUMS AND BOTANICAL GARDENS

North Carolina State Museum of Natural History.

Brimleyana, the journal of the N.C. State Museum of Natural History, received an Award for Merit in the 11th Annual International Technical Communications Competition for 1980. The competition is sponsored by the Society for Technical Communications, the world's largest professional society of its kind, with over 65 chapters in the U.S. and abroad. *Brimleyana* publishes the results of research on zoology and paleontology in the Southeast. Dr. John E. Cooper is editor and Alexa Williams managing editor.

The Hampton Mariners Museum, a division of the state museum located in Beaufort, NC, has been accredited by the Council of American Maritime Museums. Architect's plans for the new Hampton museum have been finalized; funds for construction on a donated site at the Beaufort waterfront are requested in the museum's budget for the next biennium.

A statewide North Carolina Biological Survey, combining the expertise of the State Museum and Plant Protection divisions of the Department of Agriculture, was approved in February 1980. The survey formalizes the types of activities that these divisions have been cooperatively conducting for over a century. A Faunal Survey Section has been established within the museum, with David S. Lee, Curator of Birds and Mammals, as chief. James Greene will head the Insect Survey within the plant protection division. Other coordinators of the Biological Survey are William Palmer, Howard Singletary, and Neil Lapp. Dr. Thomas L. Quay will serve as editor of a projected publication series. Dr. John Funderburg, Al Elder, and Dr. John E. Cooper will serve as advisors to the survey.

Elaine F. Potter, Associate Curator of Birds, is senior author of *Birds of the Carolinas*, recently published by the University of North Carolina Press. Museum director Dr. John B. Funderburg and Dave Lee are compiling *Mammals of the Carolinas* for the same publisher. *Seacoast Life, An Ecological Guide to Natural Seashore Communities in North Carolina*, was

published in October 1980 by the state museum, with the assistance of Sea Grant. The author is *Judith Spitsbergen*, Curator of Education at the Hampton Museum.

Dr. John E. Cooper, Director of Research and Collections, has been appointed Honorary Consultant to the Survival Service Commission of the International Union for Conservation of Nature and Natural Resources (IUCNNR). He will serve as a member of the Cave Invertebrate Specialist Group, chaired by *Dr. Francis Howarth* of the Bishop Museum, Honolulu. Dr. Cooper has for several years worked with *Dr. Raymond Bouchard* and IUCNNR's Crustacean Specialist Group.

Delaware Museum of Natural History.

Project Discovery, a hands-on approach to science and learning, is the latest achievement at the Delaware

Museum of Natural History, located in Greenville, Delaware. The focus of the project is the Discovery Room.

Opened in April of 1980, the room is available to touring school groups Tuesday through Friday, from 10:00 A.M. to 5:00 P.M. Within the room are touchable specimens of mammals, shells, and birds which are in conjunction with those in the public exhibit area. Also included in the room are sensory activities and specific lesson plans for grade levels K through 6.

The room was developed by *Alicia Ann Chomo*, Director of Education since January, 1980, along with her staff: *Elizabeth K. Walton*, Educational Coordinator since March, 1980, and *Sophie Homsey*, Educational Consultant.

Any feedback on other Hands-On projects would be greatly appreciated. Please contact any of the above-mentioned staff members at the Museum on Monday through Friday at (302) 658-9111.

ANNOUNCING

MOUNTAIN LAKE BIOLOGICAL STATION SUMMER COURSES 1981

First Term (June 10–July 14)

4 semester credits

Aquatic Ecology

Daniel J. Hornbach, University of Virginia

Biology of Birds

David W. Johnston, National Science Foundation

Field Botany

John Olsen, Southwestern at Memphis

Population Biology of Plants

Janis Antonovics, Duke University

Second Term (July 16–August 19)

4 semester credits

Animal Behavior

Glenn Hausfater, Cornell University

Animal Ecology

Stephen G. Tilley, Smith College

Insect Ecology

Earl D. McCoy, University of South Florida

Ecological Genetics

David A. West, Virginia Polytechnic Institute & State University

Graduate and Undergraduate Credit—2 hour research courses in all teaching areas. Maximum course load each term is 6 semester credits.

Additional specialty courses to be announced.

Scholarships

Service Awards for students are available covering room and board costs. Post-doctoral Research Awards (\$1700) are available for 1981.

For further information and application write to:

J. J. Murray, Jr., Director
Mountain Lake Biological Station
Gilmer Hall
University of Virginia
Charlottesville, Virginia 22901

NOTES



7.06

QH301
.A78
*

The ASB

BULLETIN

Volume 28, Number 3

(ISSN 0001-2386)

July 1981



Insect Visitor on Morning Glory

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Past President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

President Elect — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Vice-President — Donald J. Shure, Biology, Emory University, Atlanta, GA 30322

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Seawanee, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059

Sharon Patton (1984), Veterinary Pathobiology, University of Tennessee, Knoxville, TN 37916

AAAS Representative, Section G —

Lafayette Frederick, Botany, Howard University, Washington, DC 20059



CONTENTS

Walton Distinguished Lecture Series	119
Featured Research Program	122
At the Knoxville Meeting	124
Association Affairs	129
News of Biology in the Southeast	135

COVER

A bumblebee (*Bombus pennsylvanicus*) foraging in a population of morning glory (*Ipomoea pandurata*). Representatives of this hymenopteran species are the primary pollen vectors of weedy morning glories in North Carolina. The behavior of these insects is being analyzed in respect to its contribution to breeding and gene flow in these weedy plants. See "Featured Research Program." Courtesy of Dr. Jon M. Stucky, Department of Botany, N.C. State University, Raleigh.

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Co., Greenville, SC

TIME AND PLACE OF FUTURE MEETINGS

1982	April 14-17	Eastern Kentucky University, Richmond
1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984	April	Memphis State University

Walton Distinguished Lecture Series

NOTE: Each year the *Mountain Lake Biological Station* will host two lectures by distinguished scientists in various areas of field biology. The lectures commemorate Miss Margaret Walton, a long time station resident and scientific collaborator with Dr. H. H. Hobbs, Jr. The Walton Lectures are made possible through the generosity of her friends Ruth and Miles Horton of Giles County, Virginia. The lectures will be published in the *ASB Bulletin*. This first address in the Series was delivered in the summer of 1980 by Professor Eugene P. Odum of the University of Georgia.

Revival of Non-Laboratory Science

by
Eugene P. Odum

The trend in science during the past several decades has been strongly reductionist with increasing specialization, emphasis on smaller and smaller units down to the molecular and beyond, and a preoccupation with laboratory study. Accordingly, departments in universities proliferated and construction of new laboratory buildings became the major goals of our university administrations. We are all familiar with these trends in biology. As recently as twenty-five years ago most colleges and universities had one, or at most two biology departments (Botany and Zoology), usually housed in one building (often an old one). Natural history and evolution were unifying themes and field stations were considered important adjuncts. Now, the biological sciences are fragmented into dozens of departments, centers, or other units scattered all over campus. Natural history has been put on the back burner or left to amateurs, and field stations struggle just to survive. A similar proliferation of departments and change in emphasis has occurred in the federal bureaucracy that supports education and research, and which provides most of the money for new laboratories and the expensive equipment required for specialized research.

Much good, of course, has come from these reductionist trends. Scientists are

better educated, equipped, and paid. Humankind, in general, has benefited from the advances in medicine, engineering, and agriculture that have come from basic laboratory research. But many advances have benefited the affluent more than the world's poor that comprise the majority of humanity, and some advanced technology has come at an increasing cost in energy waste and pollution.

Then, between 1968 and 1970, an environmental awareness movement burst upon the scene calling to everyone's attention that many real world problems were not and could not be addressed by laboratory research alone. A lake, an ocean, a forest, or city cannot be studied and understood by taking it into the laboratory or by trying to dissect it and take the parts into the laboratory. Rather, these entities, where the real world problems lie, must be studied intact and *in situ* with the laboratory serving as the tool and not the ivory tower where scientists can escape into comfortable, small worlds. The real world consists of open, far-from-equilibrium thermodynamic systems that cannot be enclosed in glass test tubes or laboratory walls. During the 1970 decade it became evident to scientists and laymen alike that wholes were being neglected in favor of parts. The reductionist approach is obviously beginning to encoun-

ter the law of diminishing returns, as does any "one-track" approach or "monoculture."

Awareness of the global extent of and lack of scientific attention to environmental disorder had a profound effect on academic ecology, which has emerged from its roots in biology to become a new integrative discipline that links the natural and social sciences and strives to combine holism with reductionism. I have discussed this transformation in an article, published in *Science* in 1977, and have come to the following general conclusion:

"In summary, going beyond reductionism to holism is now mandated if science and society are to mesh for mutual benefit. To achieve a truly holistic or ecosystematic approach, not only ecology, but other disciplines in the natural, social, and political sciences as well must emerge to new hitherto unrecognized and unresearched levels of thinking and action."

The title of my address "The Revival of Non-Laboratory Science" is not meant to suggest, of course, that we do away with biology and ecology laboratories, but rather that we need to promote the macro-level of study as well as the micro-level of isolated components that conveniently fit into the laboratory test tube.

Interestingly enough, philosophers and historians see the "big picture" much better than scientists who tend to suffer from various degrees of "tunnel vision." The historian, for example, is accustomed to looking at events and the forces that control them over long periods of time. The philosopher constantly deals with the interplay of human thought and action through the ages. Accordingly, it is worthwhile once in awhile for us to put aside our specialty journals and read what historians and philosophers have to say about science.

In the context of my theme, historian Lynn White's recent essay entitled "The Ecology of our Science" (in the first issue

of the AAAS new Journal: *Science-80*) is recommended reading. As many of you recall, White also wrote in 1970 a widely read and cited essay entitled "The Historical Basis for our Environmental Crisis." In that one he suggested that religious dogma that sharply separates man from nature hampers our ability to understand and cope with environmental problems. In the 1980 essay, White notes that through recorded history great scientific "dynasties" have risen and fallen. In turn, the Greeks, the Chinese, Islamic peoples and the Europeans had their heyday as leaders of science. He reminds us that between the 7th and the 12th century the leading scientists in the world were Islamic, a surprising observation in view of what goes on in Islamic nations today. White warns that western science, now the dominant "dynasty," so to speak, is in danger of eclipse for the same reason that caused the collapse of earlier dynasties, namely, public dissatisfaction.

In an attempt to answer the question of why great scientific revolutions rise and then fail, Professor White examines a number of possibilities. Decline in the scientists' influence in society seems to begin when scientists become introverted, self-righteous, rigid in methodology and more concerned about preservation of their scientific establishment and privileges than in serving humanity. In other words, when scientists lose contact with the real world or literally get too deep into the ivory tower then public support, both economic and moral, begins to decline.

In the early days scientists as well as artists were often supported as patrons by wealthy merchants. Nowadays, government and private foundations (established by today's wealthy merchants such as the Rockefellers) support research and higher education. In any case, there has to be public confidence and support if aid, especially tax money, is to flow into universities and other institutions. When science becomes excessively academic and esoteric the public begins to lose interest, since the average

person can no longer understand what scientists are doing in their mysterious laboratories. Even well-educated people begin to question whether anything useful is being done to alleviate real world problems that are causing suffering for large masses of humanity. I think we can see that there are warning signs of an increasing anti-science attitude even here in the United States where we are accustomed to thinking that science is revered and will continue to be well supported no matter what.

In Professor White's opinion, the success of western science has been based on two things—the laboratory and mathematics. The laboratory, especially, has been the crown jewel: The average person's idea of a scientist is a person in a white coat surrounded by complicated instruments and convoluted glassware that goes crackle and pop far into the night. Persons in blue jeans running around the woods here at Mountain Lake are definitely not the average person's idea of a scientist. The image of the bungling or mad scientist in his laboratory is at first a joke or subject for horror movies, but unfortunately we see in this country and elsewhere that this public image of the laboratory scientist is no longer a joke. Rightly or wrongly, people perceive that scientists are spending a lot of time on research that leads to the production of deadly weapons and deadly industrial chemicals, or maybe even biological monsters created by genetic engineering. Much of this distrust, of course, comes from the lack of communication between scientists and the laymen. Specialized laboratory research is very difficult to explain even to a colleague working in another field. However, when we shift to a more holistic or non-laboratory level, I find that it is not difficult to communicate with citizens. I spend a considerable part of my time interacting with non-scientists in public forums, legislative committees

and so on. We all must involve ourselves more and more in this sort of "outreach" education or "societal learning," as the macro-education level has been called, if we are to at least mitigate the current mood in this and other countries to cut back on the rich flow of dollars to which we have become accustomed.

Professor White's challenge to western science goes something like this: Scientists need to release the tremendous inertia inherent in institutions, educational procedures, and habitual ways of doing things and develop new kinds of communication with the laity which is beginning to "talk back." *The problem is not public ignorance, but public alienation.* So dialogue needs to be directed towards reestablishing confidence in scientific goals and values and not in bombarding the public with facts and figures. My father, the late Howard W. Odum, often replied to those who bombarded him with numerous facts in support of an opinion by saying: "What you say is undoubtedly true, but what else is true." Which is a way of saying that there are other levels of concern that need to be considered.

All of which brings us back to our theme, namely, that we have promoted laboratories, and also computers and mathematics, too much as "ends" rather than "means." The power of the laboratory method is in the isolation of subjects; we need to balance this with a system science whose power lies in the integration of subjects. Ecological science is an "anti-isolationist" science of totalities that is responding to this need. We challenge biology and other disciplines to do likewise. I cannot think of a better place to meet a challenge for an expanded approach to education than here at Mountain Lake. After all, what better way to see the big picture than from the top of a mountain!

Featured Research Program

EDITOR'S NOTE: The ASB Bulletin will feature a one to two page article, in the January, July, and October issues, on new, unique, innovative research programs in the Southeast. It is the hope that these featured articles will serve to better acquaint the ASB membership with outstanding and exciting research programs in the Southeast, give added visibility to Departments, help to attract excellent graduate students, increase interest in the Bulletin, and add membership to ASB.

The Editor invites articles of up to 1000 words emphasizing the research *program*—including objectives, techniques, significance of results, source of funding, participating faculty, number of graduate students, and reference to recent theses or publications. An illustration, appropriate for the Bulletin cover, may be included. Authors are encouraged to write these in a non-technical manner, following the format here, and meaningful to the entire ASB membership. Manuscripts will be screened carefully. The first in this series is presented here.—JWH.

Reproductive Biology of Weeds, *N.C. State University*

Drs. Robert L. Beckmann and Jon M. Stucky (Department of Botany, NCSU, Raleigh, NC 27650) are working together on a long-range research program that is funded by the North Carolina Agricultural Research Service. The primary objective of this research is to describe the breeding systems and the patterns of genetic variability of several species of weeds, and their non-weedy relatives, common in North Carolina. Improved understanding of the reproductive strategies of weedy plants may permit more effective control of these agricultural pests. This research could provide basic information both for use in projection and design of control measures and for coping with, perhaps even anticipating, incipient problems such as herbicide resistance. Currently the research is focused on morning glory (*Ipomoea*), which is represented within the state by ten species. Contrasting elements of the respective reproductive systems have been described in a perennial weedy species, *I. pandurata*, and two annual weedy species, *I. purpurea* and *I. hederacea*. Experimental methods of analysis included characterization of foraging patterns of pollinating insects (infrared monitoring of night-flying moths), stigmatic pollen loads derived from various

floral manipulations, intrapopulational flow of fluorescent pollen markers, *in vivo* pollen tube growth as determined by fluorescence microscopy and SEM, and differential seed set following controlled pollinations in field and experimental populations.

The symbiotic relationship between plants of *I. pandurata* and various hymenopteran species has been described. Extrafloral pedicellar nectaries secrete a sugar- and amino acid-rich nectar that is an attractant to representatives of a variety of ant and wasp species. Territorial guarding of these nectaries by the hymenopterans serves to repel adult beetles and larval lepidopterans that otherwise would destroy floral reproductive tissues. Representatives of one of these ant species construct elaborate mud and plant debris structures on the pedicels, simultaneously ensuring their access to the nectar and excluding herbivorous insects. This is the first report of an insect shelter constructed around a plant food source.

Planned research is to be directed toward description of breeding systems in other morning glory species and quantification of genetic variability in each of the species. Investigations initiated during the previous growing season (1980), and to be continued

in the present season, focus on nectary systems, pollination mechanisms, genetic compatibility, and pollinator fidelity in the orange-flowered *I. coccinea* and the red-flowered *I. quamoclit*. Vectors and patterns of pollen flow between *I. purpurea* and *I. hederacea* also were described in the previous season and the barriers to interspecific hybridization are under investigation. Controlled pollinations and subsequent electrophoretic analysis of the progeny (as seedlings) will be performed in quantifying variability in the several species. Patterns and levels of variability will be compared in both representatives of the

noxious field weeds (such as *I. purpurea*, *I. hederacea*, and *I. lacunosa*) and the non-weedy species (such as *I. sagittata*, *I. macrorrhiza*, and *I. stolonifera*).

References:

- Beckmann, R. L. (1979) ASB Bull. 26: 94; Beckmann, R. L. and J. M. Stucky (1979) ASB Bull. 26: 94; Stucky, J. M. (1979) ASB Bull. 26: 76; Beckmann, R. L. and J. M. Stucky (1981) Bioscience 31: 50; Beckmann, R. L. and J. M. Stucky (1981) Amer. J. Bot. 68: 72-79; Beckmann, R. L. and J. M. Stucky (1981) ASB Bull. 28: 85.

IN THE AFTERNOON

While all around us—
 (meristematic apices nutate skyward
 in the spring-time stillness;
 filiclean annuli recoil in soral splendor
 as mesic nematodal madness
 backdrops basidial profusion, unseen,
 midst cacophonous coleopterans
 on the march)

We sit—oblivious—and on the patio
 have our ethyl on the rocks.

David H. Rembert, Jr.
 20 April 1981

At The Knoxville Meeting

WILLIAM D. BURBANCK—Recipient of the 1981 Meritorious Teaching Award



Although most recently a resident of Georgia for thirty-one years, Bill has a strong Hoosier background. Born in Indianapolis, the family soon moved to Richmond, Indiana where Bill attended school and Earlham College. This college experience was to influence Bill's future in several ways. After graduation from Earlham, Bill won a scholarship for graduate work at another Quaker institution, Haverford College near Philadelphia, Pennsylvania. After receiving an M.S. in Biology from Haver-

ford, Bill returned to Earlham and taught Biology for two years. During this time he met a distinguished alumnus of Earlham, Dr. W. C. Allee, Professor of Zoology at the University of Chicago, and from this meeting came the decision to earn a Ph.D. at the University of Chicago specializing in Protozoology under Dr. Allee. Earlham and the Society of Friends also exerted an influence on Bill's personal life; while at Haverford he met his future wife through a mutual friend.

After receiving his Ph.D. in 1941, Bill taught for one year at the City College of New York, for seven years at Drury College, Springfield, Missouri where he also served as chairman of the Division of Science and Mathematics, came to Georgia in 1949 as a Visiting Professor of Biology at Emory University, and has been there ever since. In the 1940's he taught for eight summers in the Invertebrate Zoology course at the Marine Biological Laboratory, Woods Hole, Massachusetts, and has returned to Cape Cod for at least a part of each year since then.

While teaching a variety of undergraduate courses, Bill's research interests were in protozoology and aquatic ecology, and particularly in the ecology of the estuarine isopod *Cyathura*. It was in this field that he taught graduate courses and directed the research of 28 graduate students for a total of 40 advanced degrees from Emory University. His last student earned a masters degree in protozoology in the summer of 1980. Bill has served the ASB in many ways. He was President of ASB, 1964-65, served on the Executive Committee twice and won the ASB Research Award in 1961,

and has been on many committees. Although now retired from teaching at Emory, Bill is still an active biologist serving on these committees, taking part in the Emory Coastal Program, and continuing his research program with *Cyathura*. He has been known to express admiration for professors who have retired from one institution only to teach again somewhere else. If an opportunity for part time teaching came along, who knows but what he might be interested?

STEVEN W. SEAGLE—Recipient of the 1981 Research Award

Mr. Seagle, of the University of Tennessee at Knoxville and Oak Ridge National Laboratory, won the award for his paper: *Implications of Microhabitat Partitioning by Small Mammals in Cedar Glade and Deciduous Forest Habitats*. The reviewers especially praised the experimental design of the research. One reviewer said that "This work appears to represent a significant contribution to the field." Another said that "[this] paper should serve as a model for similar studies"

Mr. Seagle is from Vail, N.C. and earned his B.A. in Zoology at the University of North Carolina at Chapel Hill, and his M.S. at the University of Tennessee in the Graduate Program in Ecology. His thesis advisor was Dr. Harrison W. Ambrose. Mr. Seagle is currently pursuing a doctorate at the Oak Ridge National Laboratory under the direction of Dr. H. H. Shugart.

The summary of this prize-winning paper is presented here.

In order to characterize microhabitats for the small mammal species inhabiting East Tennessee cedar glade and deciduous forest habitats, an array of thirty structural parameters was measured around the capture site of each individual and the data subjected to discriminant function analysis. *Peromyscus leucopus* and *Ochrotomys nuttalli* occupied significantly different microhabitats in the cedar glade with *P. leucopus* occurring in uniformly wooded areas and *O. nuttalli* in edge microhabitats having a high density of climbing vines. In the deciduous forest, *Blarina brevicauda* and *P. leucopus* microhabitats were also significantly dif-

ferent. Understory density was most important in distinguishing these species microhabitats with *P. leucopus* inhabiting areas of denser understory. These defined microhabitats agree with the natural history of the species. In addition, male and female *P. leucopus* occupy significantly different microhabitats in the deciduous forest where females inhabit areas with relatively denser understory, greater forest canopy closure, and a higher abundance of fallen logs. These microhabitat characteristics indicate that female *P. leucopus* occupy microhabitats affording greater protection from predators than that utilized by male *P. leucopus*. Presumably due to interspecific competition with *O. nuttalli*, the *P. leucopus* population inhabiting the cedar glade displays no intersexual microhabitat partitioning. Judging from the variance of the species distributions along the discriminant functions resulting from the data analysis, *P. leucopus* and *O. nuttalli* are, respectively, a microhabitat specialist and generalist in the cedar glade, while *P. leucopus* and *B. brevicauda* are a generalist and specialist within the deciduous forest. These microhabitat utilization patterns agree with theoretical predictions based on competition and habitat selection. Intraspecific microhabitat partitioning should increase the resource exploitation ability of *P. leucopus* and partially explain the low diversity of small rodents in southeastern deciduous forests. Since intraspecific microhabitat partitioning by small mammals has previously been demonstrated only for *P. maniculatus*, the resource exploitation hypothesis may explain why these two ubiquitous species are often regionally sympatric but seldom locally sympatric.

1981 COMMERCIAL EXHIBITORS

Agricultural Advisory Service
American Optical
Bausch & Lomb
Beckman Instruments, Inc. (Patron)
Carolina Biological Supply Co. (Patron)
Fisher Scientific (Patron)
Forestry Suppliers, Inc.
Georgia Instruments
Hunter Publishing Co.
JOEL USA, Inc.
Kontes
Martin Instrument Co. (Patron)
Optomax, Inc.
Perkin-Elmer Corp.
PARCO Scientific Co., Inc. (Patron)
Porter Instruments Service Inc./Frank Caryl Co.
Prieser Scientific, Inc.
R. L. Dotts Instruments

Scientific Products
Southern Micro. Instruments
Spectrum Scientific, Inc.
Technology Diversified
Vashaw Scientific, Inc.
W. H. Freeman & Co.
W. W. Norton & Co.
Worth Publishers, Inc.

A NEW RESEARCH AWARD

ASB has annually presented a "Research Award" for the best paper presented at the Annual Meeting. This coveted award was sponsored by Carolina Biological Supply Company through 1979, and Beckman Instruments for the past two years. The award has been given to both faculty as well as student members of ASB. Beginning in 1982, *two* research awards will be given—one for faculty, sponsored by Beckman Instruments, Inc. of Norcross, GA, and one for students, sponsored by Martin Instrument Company of Greenville, SC. Both carry a prize of \$500. It is hoped that more manuscripts will be submitted for these prizes. See the Call-For-Papers for details.

CHANGES IN BYLAWS

(Approved at the business meeting on
April 10)

Article IV. Sect. 1. Annual dues beginning 1982

- \$5.00 Graduate students
- \$10.00 Regular members
- \$12.00 Contributing members
- \$12.00 Family membership (a new category; each individual has a vote but the family receives one copy of the Bulletin)
- \$12.00 Bulletin subscription for non-members

Article VII. Sect. 2C. Research Awards Committee shall each year select recipients of the Association Research Prizes.

Article VIII. Sect. 1. All titles and abstracts of papers submitted for the program shall be in the hands of the Program Chairman by the deadline established by the Editor.

EMERITUS MEMBERS

A member of the ASB for ten or more years and who has retired from professional duties is eligible for election to Emeritus Membership. Those wishing such designation should make this request to the Treasurer.

Recently elected to Emeritus Membership are:

- Harry J. Bennett*, Baton Rouge, LA
- John A. Fincher*, Birmingham, AL
- Richard N. Kimball*, Oak Ridge National Laboratory
- Samuel L. Meyer*, Tallahassee, FL
- Fred H. Norris*, University of Tennessee, Knoxville
- John A. Patten*, Middle Tennessee State University
- Scott M. Weathersby*, Louisiana Tech University
- George Sprugel, Jr.*, Champagne, IL
- William D. Burbanck*, Emory University

NECROLOGY

During the past year, the Association lost by death the following members:

- Ernest O. Beal*, Biology Department, Western Kentucky University, Bowling Green, KY. Member 1959–1980.
- Ardis L. Cramer*, Atlanta, GA. Member 1966–1980.

ASB TREASURER'S REPORT 1 Jan. 1980--31 Dec. 1980

I. SAVINGS ACCOUNTS

A. First Alabama Bank				
Balance Jan. 1, 1980	\$5,044.78			
From Checking	3,460.24			
Interest	<u>60.66</u>	8,565.68		
To Savings, Peoples Bank		8,504.02		
To Checking (Interest & Princ.)		<u>61.66</u>		
Balance in First AL Sav. Acct.			-0-	
B. Peoples Bank				
From First AL Savings	8,504.02			
From Checking to Savings (net)	<u>(-800.00)</u>	7,704.02		
Interest		<u>203.19</u>		
Balance in Savings, Peoples Bank			7,907.21	
BALANCE IN SAVINGS (TOTAL)				7,907.21

II. CHECKING ACCOUNT

Balance on Hand Jan. 1, 1980		3,701.49		
A. Receipts				
Regular Dues/Subscriptions	8,685.00			
Patron Members	1,900.00			
Back Issues of Bulletin	70.00			
Reprints from April Bulletin	72.00			
Annual Meeting in Tampa	1,838.90			
Honorarium Reimbursement				
Bot. Soc. Amer.	291.46			
Interest & Princ. from Savings	<u>61.66</u>			
TOTAL RECEIPTS		<u>12,919.02</u>		
TOTAL RECEIPTS & BEGINNING BALANCE			16,620.51	
B. Disbursements				
-Membership and Publishing				
Production/Mailing/				
Roll Maintenance	1,907.30			
Reprints from April Bulletin	327.06			
ASB Bulletin (Vol. 27) Printing	<u>5,833.55</u>	8,067.91		
-Office Expenses				
Treasurer's (Postage, etc.)	208.86			
Editor's (Postage, etc.)	112.49			
Other Officers (Postage, etc.)	<u>41.87</u>	363.22		
-Travel and Related Expenses				
Student Travel Awards	1,297.28			
October Exec. Comm. Meeting	1,046.51			
April Speaker Honorarium and Travel	<u>582.91</u>	2,926.70		
-Research Award		<u>500.00</u>		
TOTAL DISBURSEMENTS			11,857.83	
TRANSFER TO SAVINGS (net)			2,660.24	
BALANCE IN CHECKING (Dec. 31, 1980)				2,102.44
TOTAL ASSETS (Dec. 31, 1980)				<u>\$ 10,009.65</u>

Submitted by J. C. O'Kelley, Treas.

Approved by Auditing Committee

BANQUET

The Friday evening banquet was enjoyed by over 200. The Past-President's address, by Dr. Hardin, was entitled "A View from Down Under—a Leaf" which described and illustrated, with scanning electron micrographs, the fascinating and complex *abaxial phyllosphere*. The points were

made that there are few answers for the many nagging questions regarding the adaptive significance of the numerous alternative morphological expressions found among vascular plant leaves, and that much more coordinated research on abaxial phyllospheres is needed. The summary is reproduced here (on popular demand):

Root, stem, flower, fruit,
 flavones, isozymes—Who gives a hoot?
How can you pass up something so near
 As the professional opportunities in that abaxial phyllosphere?
Why spend time with DNA, mitochondria, or some physiological shunt?
 Why delve into a field not at the forefront?
Flora, fauna, microclimate, parasites—it's all here!
 On that somewhat shady, but fantastic abaxial phyllosphere.
Don't jeopardize a thesis, promotion, or tenure,
 With unrewarding research you will just discontinue.
You ASB scientists, let out a cheer—
 Now that you know the excitement of that abaxial phyllosphere!

Association Affairs

A VIEW FROM HERE

In the ASB, as in many professional societies, most work and responsibility fall upon the treasurer and journal editor. Presidents come and go rather quickly, causing as little disruption as possible. Upon taking office ASB presidents are asked to comment on their perception of the Association. I am convinced this request is contrived. It forces us to reveal whatever plans we have for our term of office. The treasurer and editor can then develop strategies to mitigate precipitous action. The following comments should reassure Charles O'Kelley and Jim Hardin of a reasonably tranquil year.

Goals of the ASB

My perception of the ASB is that it is a vigorous and growing scientific society which contributes significantly to biological science in the southeastern United States. It is also my perception that we are not doing all that we might in support of the goals of the ASB. These goals are to promote research, disseminate knowledge, solve problems, preserve biological resources, and make as many people as happy as possible.

During the quarter-century I have been affiliated with the ASB the Association has been most successful in adding to the happiness and knowledge of those who attend the annual meetings. Of nearly equal success have been efforts to promote research and disseminate knowledge. On rare occasions we have contributed to the preservation of biological resources. Seldom have we solved fundamental biological problems.

I take this opportunity to call your attention to plans for the coming year which are intended to be supportive of the goals of the ASB. Responses will be greatly appreciated.

Teaching

The Meritorious Teaching Award continues to be the most prestigious award of the ASB. Even though Carolina Biological Supply has increased the amount of the award to \$1000 and a gold medallion, we continue to receive few nominations for this award. We hope to develop greater interest in this award during the next year.

The subject of teaching methods occupies an increasing proportion of the program at annual meetings. Those who wish to have the ASB promote excellence in teaching are encouraged to submit their suggestions to any officer or member of the executive committee. You are also encouraged to submit proposals for symposia, workshops, or paper sessions directly to the program chairman.

Research

The ASB promotes research primarily by providing a forum for the presentation of research reports and discussions with regional colleagues. Symposia and workshops attempt to address emerging concepts and to identify challenging research opportunities. There are opportunities for the ASB to go beyond these traditional activities. As a regional association the ASB could promote research projects and activities which transcend those of individual institutions. Much like the Southern Appalachian Research/Resource Cooperative,

the ASB could facilitate inter-institutional research. We might organize student and faculty exchanges which are mutually beneficial. Through the Bulletin the ASB might inform the membership of research opportunities or of field stations and laboratories which seek inter-institutional collaboration. The ASB should consider sponsoring an intern program which would provide modest cash awards to assist graduate students in visiting regional laboratories which have facilities or staff of interest to the student.

Preservation of Biological Resources

None of the goals of the ASB receive more attention, or create more frustration, than efforts to preserve biological resources. The Conservation Committee continues in its role of acquiring information needed to evaluate proposed resolutions. The *ad hoc* committee on Priorities in Public Affairs has been reappointed. This committee is to alert and inform the membership of biological issues deserving their attention. It is appropriate for the ASB to alert and inform the membership of relevant public issues and to identify ways for individuals to submit their comments. The Association should pronounce its position on public issues only after the issues have been well researched. In most cases we find ourselves in a Catch 22 situation. On the one hand, it is not reasonable to expect instant responses to complex issues. On the other hand, the most effective response is often an immediate response. It is my perception that the ASB will, for the most part, continue to favor a conservative and cautious approach to public issues.

Membership

The April 1979 issue of the ASB Bulletin included an article entitled Challenges and Opportunities for the ASB. Questions raised in that article remain unresolved. The membership of the ASB is not representative of biological science. But, is this

really a problem? Perhaps it is best to maintain the present character of the ASB.

The 42nd annual meeting in Knoxville included a modest attempt to add molecular biology, cellular biology, microbiology, and genetics to traditional strengths in systematics, ecology, parasitology, and ichthyology. One way to encourage the participation of a broader spectrum of biologists is to encourage regional chapters of other professional societies to meet with the ASB. It appears there may be an opportunity to gain the participation of developmental biologists by encouraging a regional chapter to meet with the ASB. We would certainly benefit from a reunion with physiologists who used to attend ASB meetings in large numbers. In any case, members of affiliate societies which meet with the ASB should be encouraged to become members of the ASB as well.

Wherever and however we seek new members, it is most important that we continue to attract young biologists. Scientific societies or university faculties which fail to attract bright young biologists set unreasonable limits upon their own productivity. If there is anything the ASB does better than its regional or national counterparts, it is that we provide an opportunity for faculty and students to participate *together* as professional biologists. An enduring strength of the ASB lies in its attraction to young biologists. Large numbers of students attend ASB meetings with faculty members. Equally large numbers of students attend as members of Beta Beta Beta. The ASB should continue to encourage student participation through travel awards and the recently announced student research award.

As travel costs escalate and funds for teaching and research diminish, the attractiveness of a vigorous regional professional society should increase dramatically. Universities and departments which can no longer afford to send students and faculty to national meetings are well advised to encourage participation in the ASB.

Wherever we seek new members; be it large universities or small colleges, be it from new disciplines or those already represented, we should encourage biologists to include their students when attending meetings. We should also attract those interested in biological issues and problems of a regional scale. A regional perspective, and significant student involvement are characteristics of the ASB which should contribute to the continuing vitality of the Association.

—J. Frank McCormick, President

A ROLE FOR ASB:

Seeking a Resolution of the Global Dilemma

In a policy statement passed by the North Carolina Academy of Science in April 1980, the members of the Academy called on North Carolina colleges and universities to make a greater commitment to interdisciplinary undergraduate teaching about three interrelated global problems: population growth, resource depletion, and environmental degradation. Furthermore, the Academy pledged to assist in this endeavor in every way possible. The NCAS policy statement preceded by several months "Global 2000," the report of the Council on Environmental Quality, which identified the same triad of interrelated problems. The NCAS document emphasizes inadequate understanding and recognition of the role that population growth, resource depletion, and environmental degradation play in shaping the current human dilemma. Though these three processes are major phenomena today, they will become more important in the future, because all three are increasing at an exponential rate.

According to the NCAS, progress in developing solutions to the problems encompassed by the population-resources-environment triad has been slow and discouraging because of the limited perception of the basic nature of these issues. Recognition of the interrelated, rather than separate, nature of the problems has been insufficient; and the three problems are still perceived as primarily scientific or technological in nature. By concentrating on seeking solutions to single components of the global dilemma, we have failed to see the interrelationship and inseparableness of all the components. We cannot go on avoiding the reality of the entire picture.

The NCAS believes that scientists have the responsibility to call for more teaching about these critical problems, to emphasize the interrelatedness of the three exponential processes, and to challenge the prevailing view that science and technology alone can solve these crises.

The NCAS finds that existing efforts at educating students about the major global problems are inadequate because there is no departmental category in most colleges and universities into which these problems comfortably fit. When new interdisciplinary departments or environmental science curricula are created, they tend to become isolated from the rest of the academic community along with the topics they consider. A new approach is needed, one that combines the perspectives of natural scientists, economists, sociologists, philosophers, political scientists, historians, psychologists, and others. Members of all disciplines, not just natural scientists, must be involved in discourse bearing on the critical issues.

The NCAS document specifically requested that the administration of each institution of higher learning in North Carolina appoint a review committee of interested faculty and students to examine undergraduate teaching on its campus in the three areas of population, resources, and environment and to consider how that teaching could be made more effective. In addition, the Academy suggested a series of topics that the committees should consider in evaluating and developing programs, courses, and curricula, in encouraging and insuring participation by a wide range of faculty and students, in cooperating with other institutions, and in utilizing the resources of the NCAS. The committees were encouraged to propose new teaching programs that stressed the interconnectedness and interdisciplinary nature of the problems. The NCAS urged that the project be given high priority and that it should be developed to the highest degree possible. The Academy pledged to assist in the development and facilitation of the exchange of ideas. Since April 1980, the NCAS Committee for Policy Implementation has been visiting campuses throughout North Carolina to discuss the NCAS policy statement with faculty and administrators. Reaction has been enthusiastic in most cases, and the Global 2000 Teaching Program is developing rapidly.

The NCAS is not urging the adoption of particular courses or curricula, or attempting to dictate policy. Because of the diversity of the institutions of higher learning in North Carolina, the Academy believes that many different successful approaches can be developed. The Academy itself is not locked into any set role other than taking a leadership position. It appears that the NCAS is the first professional organization in the country to propose a cooperative, state-wide effort to educate college students about the three global crises. Therefore, the Academy has had no model upon which to base its efforts.

Several state academies and the AAAS have communicated with the NCAS, requesting information about the statement. A synopsis of the statement has been published by the AAAS Office of Education. Drs. Charles and Martha Jenner, authors of the NCAS statement, were invited to represent the North Carolina Academy at a national leadership conference on

the Global 2000 report. That conference put the NCAS in contact with people and groups throughout the nation who have similar concerns about the critical educational problem identified in the NCAS document.

The ASB Conservation Committee has carefully studied the NCAS policy statement, interviewed participants and key people in the North Carolina program, discussed the statement with ASB officers and appropriate committees, and concluded that the ASB should endorse the positive steps that the North Carolina Academy of Science has taken in implementing its Global 2000 Teaching Program. The Conservation Committee wishes to recommend that the Association of Southeastern Biologists adopt the basic premises outlined in the NCAS document, use its membership and resources to assist in the development of interdisciplinary teaching programs, and encourage and develop other interdisciplinary activities that deal with the interrelated problems of population growth, resource depletion, and environmental degradation.

The Conservation Committee recognizes that there are many problems inherent in the development of any interdisciplinary program. Even though the problems of population, resources, and environment have been predicted and addressed for years, we feel that enthusiasm for attempts to effect solutions to the problems should not be dampened by apathy, pessimism, or the lack of solutions thus far. We recognize that the NCAS program may be too optimistic about the prospects of solving all problems with an interdisciplinary approach, but we are also convinced that, since the origins of these global problems are partly rooted in sociological, anthropological, political, and religious dogma, the scientist has a moral obligation to challenge the prevailing view that science and technology alone can solve these problems. We must state this conviction and urge interdisciplinary approaches to work toward solutions. The ASB Conservation Committee is in basic agreement with the approach proposed by the NCAS, and feels that its program is a positive start in the right direction. We believe that the program begun by the NCAS in North Carolina provides a good example, a "jumping-off place," from which the ASB can take the responsibility and initiative to support interdisciplinary teaching, and to develop other kinds of interdisciplinary programs.

The Conservation Committee proposes the following possibilities for action and involvement by ASB and its members:

- (a) The ASB can sponsor interdisciplinary symposia and workshops involving biologists and scientists-at-large, energy producers, engineers, economists, financiers, politicians, environmental regulators, religious leaders, etc. addressing solutions to the global dilemma. This activity may occur at ASB annual meetings or other occasions, and could involve cooperation with state academies.
- (b) ASB members can assist universities and colleges in the development of interdisciplinary workshops,

speaker programs, and other activities on their campuses.

- (c) Individual members of ASB can initiate review of environmental education curricula at their home institutions and take steps, where appropriate, to help establish pertinent interdisciplinary courses.
- (d) An advisory group of interested ASB members could be created to assist any interested parties.
- (e) ASB can offer technical assistance in organizing workshops that bring together people from diverse disciplines to discuss policy and solutions.
- (f) In all of its efforts and activities, the ASB can strive to educate decision makers (people in industry, banking, government, etc.) about the interrelatedness of global problems.

We realize that setting up additional curricula to reach college students will not have a significant effect for some decades. For this reason, we believe the ASB should immediately initiate programs to educate present-day decision makers. It is not ASB's role to dictate the academic affairs of institutions or call for new programs which are increasingly more difficult to implement. The program as outlined by the Conservation Committee will encourage each academic institution to do what it feels is possible in its circumstances, and the program will also go beyond academia in attempting to reach current policy and decision makers.

We urge the membership and the leadership of ASB to support the proposal of the Conservation Committee and to participate in the development of interdisciplinary programs dealing with population growth, resource depletion, and environmental degradation.

—ASB Conservation Committee
William H. Martin
Douglas A. Rayner
Michael J. Baranski, Chairman

MERITORIOUS TEACHING AWARD 1982 CALL FOR NOMINATIONS

For most of us one of our most important professional functions is to teach. From the students' viewpoint, probably only a few of us do it well! The ASB wants to be certain that outstanding instruction in biology is recognized.

As part of the selection process for our annual Teaching Award, we plan to publish in the Bulletin the names of all who are nominated. As usual, the selection will be announced at the 1982 April meeting.

Please take a moment to consider for nomination someone you feel is worthy of

this award. Nominees should be ASB members, active or recently retired. Selections generally have been senior people, but unusually qualified younger faculty members are also eligible. See the "Call-for-Papers" for the nomination form.

—James L. Riopel, Chairman

MERITORIOUS TEACHING AWARD SELECTIONS

1952 Mary MacDougall
1953 Orland E. White
1954 Woolford Baker
1955 John N. Couch
1956 Hugo Blomquist
1957 Ezda M. Deviney
1958 Henry R. Totten
1959 Margaret N. Hess
1960 Ora C. Bradbury
1961 Warren Deacon
1962 Septima C. Smith
1963 Patrick Yancey
1964 Ruskin S. Freer
1965 H. P. Sturdivant
1966 Charles Ray, Jr.
1967 H. J. Oosting
1968 Wade T. Batson
1969 William L. Mengebier
1970 Elton C. Cocke
1971 Earl L. Core
1972 Aaron J. Sharp
1973 H. H. Hobbs, Jr.
1974 Grace J. Thomas
1975 L. M. Outten
1976 J. J. Westfall
1977 Margaret L. Gilbert
1978 Albert E. Radford
1979 Eugene P. Odum
1980 Robert B. Short
1981 William D. Burbancek

THE FUTURE OF ASB

In this issue of the Bulletin, President McCormick calls for a broader spectrum of biologists in ASB, the Conservation Committee encourages a new activist role, and Dr. Eugene Odum speaks of new challenges for biology. To have an active voice in the future of ASB, send your nominations for officers soon. See the "Call-for-Papers" for the nomination form.

—Nominating Committee

ASB OFFICERS, COMMITTEES, AND REPRESENTATIVES: 1981–1982

President—J. Frank McCormick, Graduate Program in Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065).

President-Elect—Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802 (813/683-5521 ext. 472).

Vice-President—Donald J. Shure, Biology, Emory University, Atlanta, GA 30322 (404/329-4209).

Retiring President—Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24503 (804/846-7392).

Secretary—Carol C. Baskin (1982), Biological Sciences, University of Kentucky, Lexington, KY 40506 (606/258-8770).

Treasurer—J. Charles O'Kelley (1983), Biology, University of Alabama, University, AL 35486 (205/348-5960).

Executive Committee Members-at-Large—Samuel B. Jones (1982), Botany, University of Georgia, Athens, GA 30602 (404/542-3732); George S. Ramseur (1982), Biology, The University of the South, Sewanee, TN 37375 (615/598-5931 ext. 304); Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132 (615/898-2829); James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223 (704/597-2315); Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059 (202/636-6929); Sharon Patton (1984), Pathobiology, University of Tennessee, Knoxville, TN 37916 (615/546-9230 ext. 339).

Auditing Committee—*Chairman*: Robert R. Haynes (1982), Biology, University of Alabama, University, AL 35486 (205/348-5960); H. E. Smith (1982) and J. F. Scheiring (1982), Biology, University of Alabama, University, AL 35486 (205/348-5960).

Conservation Committee—*Chairman*: William H. Martin (1982), Natural Areas, Eastern Kentucky University, Rich-

mond, KY 40475 (606/622-3122); Douglas A. Rayner (1983), South Carolina Wildlife and Marine Resources, Columbia, SC 29202 (803/758-6314); Gary Larson (1984), Uplands Research Lab., Great Smoky Mountains National Park, Gatlinburg, TN 37738 (615/436-7120).

Local Arrangements—Chairman: William H. Martin, Natural Areas, Eastern Kentucky University, Richmond, KY 40475 (606/622-3122); *Program Chairman:* John P. Harley, Biology, Eastern Kentucky University, Richmond, KY 40475 (606/622-2271).

Meritorious Teaching Award Committee—Chairman: James L. Riopel (1982), Biology, University of Virginia, Charlottesville, VA 22901 (804/924-3981); Beryl Franklin (1983), Biology, Northeast Louisiana University, Monroe, LA 71201 (318/342-3103); Sandra T. Bowden (1984), Biology, Agnes Scott College, Decatur, GA 30030 (404/373-2571).

Nominating Committee—Chairman: James W. Hardin, Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226); Dolores S. Dundee, Biology, University of New Orleans, New Orleans, LA 70122 (504/826-6307); Burton J. Bogitsh, Biology, Vanderbilt University, Nashville, TN 37235 (615/322-2961).

Past-President's Council—Chairman: Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24503 (804/846-7392).

Place of Meeting Committee—Chairman: Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602 (404/542-3732); Bill Murdy (1983), Biology, Emory University, Atlanta, GA 30322 (404/329-4211); Cletus Sellers (1984), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6652).

Priorities in Public Affairs Committee—Dan J. Pittillo, Biology, Western Carolina University, Cullowhee, NC 28723 (704/227-7244).

Research Award Committee—Chairman: George S. Ramseur (1982), Biology, The University of the South, Sewanee, TN 37375 (615/598-5931); Diane Nelson (1983), Biology, East Tennessee State University, Johnson City, TN 37601 (615/929-4329); Diane O. Flemming (1983), Biology, Wright State University, Dayton, OH 45431 (513/873-2310); James D. Caponetti (1984), Botany, University of Tennessee, Knoxville, TN 37916 (615/974-2256); David Husband (1984), Biology, University of South Carolina, Columbia, SC 29208 (803/777-4255).

Resolutions Committee—Chairman: Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24503 (804/846-7392); John P. Harley, Biology, Eastern Kentucky University, Richmond, KY 40475 (606/622-2271); Joseph E. Winstead, Biology, Western Kentucky University, Bowling Green, KY 42101 (502/745-0111).

Student Award Committee—Chairman: Robert L. Beckmann (1982), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-3341); Jack Davis (1983), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6225); Hazel Delcourt (1984), Oak Ridge National Laboratory, Oak Ridge, TN 37830 (615/574-7814).

Editor, ASB Bulletin—James W. Hardin (1983), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226 or 2727).

Editor, News and Notes—Jon R. Fortman (1984), Biology, Mississippi University for Women, Columbus, MS 39701 (601/328-0812).

Archivist—Madeline P. Burbanck, Biology, Emory University, Atlanta, GA 30322 (404/329-4205).

AAAS Representative (Section G)—Lafayette Frederick (1982), Botany, Howard University, Washington, DC 20059 (202/636-6929).

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE

University of Miami, School of Marine and Atmospheric Science. **Dr. Edwin S. Iversen**, Professor of Marine Biology and **Dr. Scott E. Siddall**, Research Associate, are developing techniques for mass-rearing queen conch (*Strombus gigas*), a mollusc prized by Bahamian and Caribbean islanders and shell collectors. The work of Drs. Siddall and Iversen indicates that soon it will be possible to produce great numbers of young conchs in a hatchery to raise to marketable size in shallow-water pens or to release to restock severely depleted natural populations.

University of Tampa, Division of Science and Mathematics. **Dr. Fred Punzo** has accepted a tenure track position to teach physiology. Dr. Punzo is currently teaching at Blackburn College in Illinois. A faculty/student research project has been initiated to observe the recolonization of Blackwater Creek, recently decimated by extensive industrial pollution. Professors involved are **Drs. Price, Schlueter**, and **Smith**. **Dr. Snell** and his students are researching several parameters on rotifer populations as part of an international grant with Israel.

Emory University, Biology Department. **P. Dennis Smith**, Principal Investigator and **Ruth L. Dusenbery**, Co-Investigator have been awarded an EPA Grant for 1980–83. The research title is "A Single Gene Mutagenesis System in *Drosophila*."

Florida State University, Department of Biological Sciences. New faculty joining the department this academic year include: **Dr. Joseph Travis**, Assistant Professor (Ph.D. in Zoology from Duke University in 1980); **Dr. Thomas Roberts**, Assistant Professor (Ph.D., University of Notre Dame), comes to Florida State from the Department of Embryology at the Carnegie Institution of Washington; **Dr. William H. Outlaw, Jr.**, Associate Professor, from Washington University in St. Louis (Ph.D., University of Georgia). **Dr. Anne Pates** has retired from the department as of June 1980. Dr. Pates taught at Florida State University for 31 years prior to her retirement and designation as Professor Emerita.

University of Florida, Department of Botany. **Dr. George Bowes**, Associate Professor of Botany, will serve on the Photosynthesis Panel for Competitive

Research Grants, U.S.D.A., which is to meet in Washington, D.C., in May 1981. **Dr. Robert J. Ferl**, Assistant Professor of Botany, is spending the period April 1–August 1, 1981 in the laboratory of **Dr. W. J. Peacock**, Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia, working on problems of molecular structure of plant genes. Dr. Ferl's specific purpose in working with Dr. Peacock is to help complete the molecular cloning of maize Adh genes. **Dr. Walter S. Judd**, Assistant Professor of Botany and Curator of the Vascular Plant Herbarium, is working on *Agarista* (Ericaceae) for *Flora Neotropica*. His monograph on *Lyonia* will be in three parts, one in each of the next three issues of the *Journal of the Arnold Arboretum*. **Dr. Norris Williams**, Associate Professor of Biology, Florida State University, will join the faculty of the Florida State Museum, University of Florida, Gainesville, July 1, 1981. Williams will serve as Associate Curator and Keeper of the University of Florida Herbarium which has been transferred administratively from the Department of Botany to the Florida State Museum. He will have an affiliate position in the Department of Botany as Associate Professor for academic purposes, for teaching, and for working with graduate students. The Department of Botany will offer a new intensive course in "Tropical Botany" between July 8 and August 5, 1981, based at Fairchild Tropical Garden in Miami. **Dr. Walter S. Judd**, Assistant Professor of Botany and Curator of the Vascular Plant Herbarium, will serve as director of the course and teach the section on systematics. **Dr. Terry W. Lucansky**, Associate Professor of Botany, will teach the segment on anatomy and morphology. **Dr. William L. Stern**, Professor of Botany and Chairman of the Department, will cover the part devoted to the economic botany of tropical plants. Biologists have moved into new facilities at the Center for Aquatic Weeds, located 7 miles northwest of the University of Florida campus at Gainesville. Faculty include: **Dr. L. M. Hodgson**, Department of Botany (phycology), **Dr. W. T. Haller**, Agronomy Department (aquatic plants), **Dr. D. E. Canfield, Jr.**, School of Forest Resources and Conservation (limnology), **Dr. J. V. Shireman**, SFRC (fisheries), and **Dr. H. L. Schramm, Jr.**, SFRC (fisheries). The new facility will be devoted both to solving specific aquatic weeds problems of the state of Florida and to increasing understanding of subtropical aquatic ecosystems in general. **Dr. James W. Kimbrough**, Professor of Botany, presented a seminar during a visit to the Department of Botany, University of Texas, March 25–26, on the subject "Biology and Taxonomy

of Mycorrhizae." He has been invited to present a major lecture on the fungi on insects to the Eastern Branch, Entomological Society of America, meeting at Syracuse N.Y., October 5-7, 1981. **Dr. Daniel B. Ward**, Professor of Botany, will become President of the Florida Academy of Sciences on May 1, 1981. He succeeds another botanist, **Dr. F. Harvey Miller** of the University of Central Florida, in this office.

North Carolina State University, Department of Zoology. **Dr. Jay D. Hair** has received the Governor's award as North Carolina's Conservationist of the year. Dr. Hair has accepted the post of Executive Vice President of the National Wildlife Federation and will be leaving his position on the faculties of the Zoology and Forestry Departments. **Dr. Jeffrey Walters** has accepted a position as an Assistant Professor in the Zoology Department. Dr. Walters received his Ph.D. degree from the University of Chicago and is completing a postdoctoral year at the University of California, Berkeley. His specialty is ornithology with a focus on the behavior and ecology of shore birds.

Georgia Southern College, Department of Biology. **Dr. William Bruce Ezell, Jr.** was a guest lecturer for the students and faculty of the Department of Biology at Sul Ross State University in Alpine, Texas. Dr. Ezell appeared as a part of the University's "Speakers in Biology Series." The talk was entitled "Man and Marsh, Why Wetlands are Needed." **Drs. Sara N. Bennett** and **Wayne A. Krissinger** attended the NSF Chautauqua Short Course at the University of Georgia on the topic of "Immunobiology." **Dr. Don J. Drapalik** attended the NSF Chautauqua Short Course on "Ecology and Evolution in the Tropics." **Dr. Don A. Olewine** has been funded by NSF for an "Institute on Chemistry, Physiology, and Computers: for summer 1981." The program offers talented high school students from rural and inner-urban schools opportunities for lab experiences of experimental data. **Jim Campbell**, a graduate student in Georgia Southern's M.S. Biology program, has been selected to receive an NSF Graduate Fellowship. From more than 3000 science students applying, only 72 fellowships were awarded to biology graduate students. His research work is under **Dr. James H. Oliver, Jr.**, on hormonal regulation of development in acarines.

Wesleyan College, Division of Science and Mathematics. **Patricia H. Lewis**, Division Chairman, and **Janet A. Williams**, Instructor of Biology, attended the 1981 Ewald Scholars Symposium: "Pongids and Homioids" on April 28-29, 1981, at Sweet Briar College. Primatologists **Jane Goodall**, **Dian Fossey**, **Birute Galdikas**, and **Francine Patterson** presented a series of lectures and slides on the topic, "What We can Learn About Humankind from the Apes." **Dr. Steven McCullagh**, Assistant Professor of Biology recently completed a Chautauqua course in "Tropical Ecology and Evolution."

Louisiana State University, Botany Department. **Dr. Shirley C. Tucker**, Professor of Botany, will attend

the XIII International Botanical Congress this August in Sydney, Australia using travel allowances from the Botanical Society of America and the National Science Foundation. **Dr. Russell L. Chapman**, Associate Dean of the College of Arts and Sciences and Associate Professor of Botany, has received the 1981 LSU Alumni Federation Distinguished Faculty Award in recognition of his outstanding contributions to the university in teaching, research, and administration. The award carries a stipend of \$1000. He has also received a travel allowance from NSF to attend the XIII International Botanical Congress. **Dr. David J. Longstreth**, Assistant Professor of Botany, has received an LSU Institutional Agreements Program Research Award through the Energy Programs Office. The award for one year concerns "Control of Biological Conversion of Solar Energy in Alligator Weeds." **Dr. Michael T. Postek**, of the Department of Botany, is assuming a position as Applications Laboratory Directory at AMRAY, a scanning electron microscope company based in Boston, Mass. **Dr. Meredith Blackwell**, Associate Professor of Biology at Hope College, Holland, Michigan, will be joining the faculty as a specialist in mycology and plant ultrastructure in the fall of 1981.

University of North Carolina, Highlands Biological Station. The Highlands Biological Foundation, Inc. has established the **Thelma Howell Memorial Fellowship** to support outstanding young scientists conducting research on the southern Appalachian biota and ecosystems at the Highlands Biological Station. The first Thelma Howell Scholar is **Mr. Steven R. Kleeberger**, a Ph.D. candidate at Kent State University, whose dissertation research is "Niche response structures and niche segregation of two Desmognathine salamanders." Mr. Kleeberger has also been awarded a grant-in-aid from the Station to complete his research support. Other recipients of grants-in-aid from the Station in 1981 are **Richard E. Baird**, University of Tennessee; **Kenneth N. Baker**, University of Pennsylvania; **Richard L. Blanton**, University of North Carolina at Chapel Hill; **Robert D. Davie**, Kent State University; **Don C. Forester**, Towson State University; **Richard Kneisel**, Emory University; **Kiisa C. Nishikawa**, University of North Carolina at Chapel Hill; **Edward Pivorun**, Clemson University; **James D. Sather**, University of North Carolina at Chapel Hill; **Nancy E. Stamp**, University of Florida; **R. Michael Weber**, North Carolina State University; **Quentin D. Wheeler**, Cornell Univ.; **Kenneth D. Whitney**, University of North Carolina at Chapel Hill; and **Edward J. Zalisko**, Southern Illinois University at Carbondale. Inquiries about grant-in-aid support for pre- and post-doctoral research conducted at Highlands on the biota and ecosystems of the Southern Appalachians should be directed to the Executive Director, Highlands Biological Station, P.O. Drawer 580, Highlands, N.C. 28741.

North Carolina State University, Department of Horticultural Science. **Dr. L. George Wilson** and **Dr. Wanda Collins** were invited to participate in the "1981

International Symposium on Sweet Potato" in Taiwan, ROC, March, 1981. Dr. Wilson presented a paper entitled "Mechanization of planting and harvesting of sweet potato." Dr. Collins presented a paper entitled "Potential for increasing nutritional value of sweet potatoes." **Dr. J. C. Raulston** was awarded the "NCSU Outstanding Teaching Award" this year, the second such honor in the last three years. Two of the ten NCSU "Minigrants for Support of Innovative Classroom Projects and Improvement of Teaching Effectiveness and Evaluation" were awarded to departmental faculty. **Dr. Paul R. Fantz** received a minigrant for the "Development of a Synoptic Herbarium Collection" for the ornamental plant identification courses. **Dr. Ted E. Bilderback** received a minigrant for "Mediated Procedures in Nursery Production and Arboriculture" for use in these courses. **Drs. Wanda W. Collins** and **R. D. Locy** received an 18-month grant from the North Carolina Board of Science and Technology. The research project entitled "Sweet Potato Cultivar Development for True Ethanol Production" will employ both conventional field breeding and tissue culture techniques in the development of high biomass, high protein, and high α -amylase types of sweet potatoes for potential use as feedstock sources for ethanol production.

Pfeiffer College, Biology Department. **Dr. John Haesloop** has returned to the department as full-time Professor of Botany after a seven year term as Vice-President of Academic Affairs and Dean of the College.

North Carolina State University, Department of Botany. **Dr. Hugo Rogers** has been awarded a grant from the Department of Energy to study the effects of high carbon dioxide levels on vegetation. **Dr. Robert Beckmann** and **Dr. Sukhraj Dhillon** received grants from the North Carolina Board of Science and Technology to study polyploidy in Ash species and Soybean cotyledon senescence, respectively.

College of Charleston, Grice Marine Biological Laboratory. **Drs. William Anderson, Charles Biernbaum, Norman Chamberlain, Chris Koenig**, and graduate student **Jose Castro** spent ten days this past August doing marine research at Ascension Island in the South Atlantic. Of the many intertidal and subtidal organisms collected from this young volcanic island, amphipods are being investigated by Dr. Biernbaum, decapods by Dr. Chamberlain, and fishes by Drs. Anderson and Koenig and Mr. Castro. Other taxa will be distributed to appropriate specialists by the Smithsonian Oceanographic Sorting Center. Dr. Biernbaum also made collections of terrestrial amphipods found in vegetated areas up to 2800 feet elevation.

Southwestern at Memphis, Biology Department. Two instructors, **James Michael Olcese** and **David H. Kesler** joined the department as Assistant Professors of Biology. Dr. Olcese earned his doctorate from Marquette University in 1979 and taught as a visiting Assistant Professor there between 1977 and 1980. His

area of research is on fish neuroendocrine mechanisms following exposure to various experimental conditions. **David Kesler**, an adjunct Assistant Professor of invertebrate zoology at Brown University, received his Ph.D. from the University of Michigan. He has also taught at the University of Rhode Island and was a teaching fellow at the University of Michigan. His fields of research are animal and community ecology and freshwater biology.

Middle Tennessee State University, Department of Biology. **Dr. Wayne Rosing** joined the department as an Assistant Professor, coming from George Peabody University where he had taught for 4 years. He received his Ph.D. from the University of Texas. **Mrs. Sarah F. Barlow** joins the faculty as an Instructor of Biology. She received her B.S. and M.A. from MTSU and is presently engaged in further graduate studies. Another new addition to the department is **Mrs. Sally Swain**. She has her B.A. from the University of Chattanooga and M.A.T. from Vanderbilt University. Mrs. Swain taught in the department from 1968 to 1975 and has been teaching at Cumberland College for the past six years. **Dr. J. Lane Fletcher** is retiring at the end of the 1980-81 academic year. Dr. Fletcher received his Ph.D. from Texas A&M College, and joined the department in 1961. He has taught at McNeese College and Mississippi State College. He also served as a Research Associate at LSU, and as an Environmental Physiologist and Geneticist with the USDA. **Dr. Philip M. Mathis**, Associate Professor of Biology, was named Editor of the Society for College Science Teachers' *Quarterly Bulletin* and other official publications of the Society. His selection was based on his past editorial experience, publications record, and demonstrated interest in college science teaching.

Virginia Military Institute, Department of Biology. **Dr. Alan G. C. White**, Head, Department of Biology, and Professor of Biology for the past 14 years, will retire effective the end of June 1981. **Dr. John H. Reeves, Jr.**, Professor of Biology, has been named to succeed Dr. White.

Virginia Commonwealth University, Department of Biology. **Dr. Charles Blem**, Professor of Biology, has been elected this year to full membership in the AAAS. **Dr. Sara M. McCowen** has been awarded two research participation grants from NSF. These grants will fund research projects for a number of gifted students in special categories at both college and high school levels. **Dr. G. C. Llewellyn** has received a Department of Energy Faculty Development Grant for Teachers. **Dr. Joe Chinnici** and **Dr. T. Dan Kimbrough** have recently been awarded Grants-in-Aid for Research by VCU. Dr. Chinnici's study is entitled "Sampling Natural Populations of *Drosophila* for Aflatoxin Resistance." Dr. Kimbrough's award was given for development with **Dr. John D. Reynolds** of "A New Microtechnique for the Assay of Serotonin in Plants." **Drs. R. W. Fisher, J. E. Gates, and S. R. Webb** have been promoted to Associate Professor. VCU's first

greenhouse is nearing completion on the roof of the Life Sciences Building.

University of Richmond, Department of Biology. **Dr. William S. Woolcott** has been named the *D.A. Kuyk* Professor of Biology. This renewal appointment is for a period of six years. **Dr. R. Dean Decker** is serving as the director of the Virginia Junior Academy of Science. **Dr. Warwick R. West, Jr.** is serving as the current secretary of the Virginia Academy of Sciences. **Dr. David W. Towle** headed the organization of a symposium on "The James River: Its Use and Misuse." It was sponsored by the University of Richmond Sigma Xi Club.

University of Georgia, University of Georgia Press. **Wilbur Duncan** and **John T. Kartesz** have just published their latest book, *Vascular Flora of Georgia: An Annotated Checklist*. Duncan is Professor Emeritus at the University of Georgia and a professional botanist. Kartesz is executive director of the Biota of North America program and the author of two volumes in their series. *Vascular Flora of Georgia* is an annotated list of 3686 species, subspecies, varieties, and hybrids occurring in Georgia. Rare and endangered species are also noted. This is the first up-to-date listing of authentic names; from this, a researcher can check to see whether a species occurs in the state and if it is within a certain area. The list is the result of Duncan's forty-two years of work as a leading botanist in the state.

ABOUT INSTITUTIONS

University of Tampa, Division of Science and Math. A new instrumentation laboratory will be completed this spring. This facility is to be shared by biologists and chemists involved with molecular-level investigations. The University is implementing a calendar change in which some courses will be taught in a concentrated mode over seven weeks. Those courses not suitable for the bimester program will continue to be offered on the 14 week basis. Extensive curriculum revision has taken place in all areas of the University.

University of Central Florida, Department of Biological Sciences. The department has been authorized to add a new graduate degree program. In addition to the Master of Science in Biological Science, the Department will offer a Master of Science in Microbiology beginning August, 1981. The new program requires completion of a research thesis and a minimum of 24 semester hours of required and elective courses. For additional information, write Graduate Program Coordinator, Dept. of Biological Sciences, University of Central Florida, Orlando, FL 32816.

Georgia Southern College, Department of Biology. The department recently acquired lease to a Pine-Savanna-Pitcher Plant-Bog Tract within 6 miles of the campus. The 74.5 acre site is conveniently accessible for short labs and field trips as well as for faculty and

graduate student research. Several endangered species of the S.E. are found in the tract.

North Carolina State University, Department of Horticultural Science. The 1980-81 fiscal year was a most significant one for the NCSU Arboretum. Under the direction of *Dr. J. C. Raulston*, the following were accomplished: (1) the formal dedication of the NCSU Arboretum; (2) the visitor center was completed with display boards installed and educational displays developed with a series of public information circulars made available for center visitors; (3) the parking lot was completed; (4) a "calendar walk" was developed to teach visitors about bloom sequence in North Carolina; (5) home landscape displays were installed, including hedges, ground covers, roses, turfgrasses, and two model gardens displaying an "edible landscape" and "native wild flowers"; (6) remodeling of the research lath house to provide a specialty plants display house; (7) a memorial garden was developed and planted in honor of the late *Dr. Russell Southall*, horticultural teacher of plant identification, who died of brain cancer in 1979; and (8) site preparation for the future Japanese garden was started. A "Friends of the Arboretum" membership program has been initiated.

The NCSU Horticulture Club was presented the "Best of Horticulture" award at the 1981, 21st Annual Southern Living Show held in Charlotte, North Carolina, their ninth award in the last nine years. The landscape display entitled "Garden Getaway" was designed by *Clara Allen*. The club placed fifth in the 1981, 38th National Intercollegiate Flower Judging Contest held in San Luis Obispo, California.

LSU Center for Wetland Resources. A new publication has recently been released by the Center for Wetland Resources titled: "Red Swamp Crawfish, Biology and Exploitation." This volume explores in depth the biology, management, and culture of the red swamp crawfish. Beginning with a discussion of the anatomy and disease, the book moves to nomenclature, classification, habitat, and predators. Written to fill a variety of needs, the book is truly invaluable in a wide range of professions, from crawfish farming to teaching. The book costs \$7.50 and may be purchased by mailing a request to Sea Grant Communications, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA 70803.

Mississippi-Alabama Sea Grant Consortium. The Marine Environmental Sciences Consortium has been approved for membership in the Mississippi-Alabama Sea Grant Consortium. *Dr. James I. Jones*, MASGC Director, has announced. The MESC is comprised of nineteen Alabama institutions of higher education. Additionally, facilities and full time professionals at the Dauphin Island Sea Lab extend the research and educational capabilities of the MESC member institutions. *Dr. George F. Crozier* is Executive Director of the environmental research and education group.

Gulf Coast Research Laboratory, Ocean Springs, Mississippi. The 1980 issue (Vol. 6, Number 4) of *Gulf*

Research Reports, a scientific journal published by the GCRL, was distributed during February. *Dr. Harold D. Howse*, editor, said that 783 copies were put in the mail, including 295 copies for overseas addressees. The publication is sold through the Lab Bookstore. The GCRL has contracted, for another year, to supply the Lawrence Berkeley Laboratory of the University of California with further data on the zooplankton community of proposed Ocean Thermal Energy Conversion sites. The Laboratory's long-term project entitled "Studies on Toxicity of Ocean Thermal Energy Conversion Plant Components on Selected Marine Animals from the Gulf of Mexico," has been funded for the third year. *Charles K. Eleuterius*, section head, Physical Oceanography Section, and *Sheree Beaugez*, numerical analyst, have coauthored a hydrographic/climatic atlas for the Mississippi Sound. *Dr. William Walker*, head of the toxicology group at GCRL, is the principal investigator on an extension of a project entitled "Development of Fate/Toxicity Screening Tests." Three staff members recently presented papers at the annual meeting of the Gulf Estuarine Research Society. They are *Dr. Sally Richardson*, *Dr. Richard Heard*, and *John Steen*. *Dr. Richardson's* topic was "Fish Populations in Estuaries," and *Dr. Heard* spoke on "Taxonomy and Distribution of Fiddler Crabs in the Gulf of Mexico." *John Steen's* paper was entitled "Diel Vertical Migration and its Effects on Near Surface Zooplankton Population Patterns in a Low-Salinity Bayou System." *Dr. Gordon Gunter*, *Dr. Terry McBee*, and *Walt Brehm* also attended the meeting. *Dr. Lionel Eleuterius*, head of the botany section, reports that work on the publication "Illustrated Guide to Tidal Marsh Plants of Mississippi and Adjacent States" is scheduled for publication in early 1981.

Kentucky Nature Preserves Commission. Under the direction of *Donald F. Harker, Jr.*, the Commission has been conducting regional floral and faunal surveys of Kentucky which have resulted in publications of interest to southeastern biologists. The *Kentucky Natural Areas Plan* is a three volume publication representing a valuable addition to the knowledge of Kentucky's natural history. It is available prepaid for \$45.00 per set, including postage and handling. The Commission has also established a new scientific and technical series for major papers dealing with all aspects of the natural history of Kentucky. The first issue is *Ferns and Fern Allies of Kentucky* and is available at \$4.50 per copy. Both publications can be ordered from: Kentucky Nature Preserves Commission, 407 Broadway, Frankfort, Kentucky 40601.

Duke Power Company, Environmental Services Section. The Eighth Annual Meeting of the Carolinas Area Benthological Workshop (CABW) will be held November 5-6, 1981 at Duke Power Company's Environmental Laboratories on Lake Norman, approximately 25 miles north of Charlotte, N.C. Any researchers or students working with or interested in

the aquatic (primarily freshwater) macroinvertebrates of North and South Carolina are invited to attend. Discussions are conducted in an informal atmosphere, to update our taxonomic and ecological information, review the status of ongoing regional projects, and exchange ideas on equipment and methodology. To receive a program and registration information, please contact: *David A. Braatz*, Duke Environmental Laboratories, Route 4, Box 531, Huntersville, N. C. 28078. (704) 875-1381.

ABOUT MUSEUMS AND BOTANICAL GARDENS

North Carolina State Museum of Natural History. A symposium on "The Biology of the Seaside Sparrow," sponsored by the North Carolina Biological Survey and cosponsored by the U.S. Fish and Wildlife Service and the National Audubon Society, will be held at the North Carolina State Museum of Natural History on October 1 and 2, 1981. Symposium organizers are *Dr. Thomas L. Quay* and *David S. Lee*. Invited speakers will present a series of papers covering nearly all aspects of the distribution, ecology, life history, and evolution of the bird, a salt marsh species found from New York to Texas. Speakers will include *Drs. Oliver Austin, John Funderburg, John Hardy, Eugene Hester, Herbert Kale, Thomas Quay, Sandy Sprunt, Paul Sykes*, and others. The results of the sessions will be published by the State Museum in a single volume. *John Henry Dick*, noted artist who illustrated *The Warblers of North America* and *Birds of India*, will prepare for the publication a color plate illustrating all races of seaside sparrows.

Ray E. Ashton, Jr., NCSM Director of Education, has been appointed to the American Association of Museums' Assessment Program. Museum professionals working with the program troubleshoot problems in museums and assist them in preparing for accreditation reviews. Ashton also is education chairman of the AAM's long-range planning committee.

Results of the museum's multidisciplinary study of the Neuse River Waterdog, *Necturus lewisi*, will be published in *Brimleyana* in 1982. Support for the publication of this report is being provided through a contract with the North Carolina Wildlife Resources Commission, under the provisions of a cooperative agreement with the U.S. Fish and Wildlife Service. The publication will include work of the principal investigators, *R. E. Ashton, Jr.* and *A. L. Braswell*, along with that of *M. Nickerson* and *F. Taketa*, Milwaukee Public Museum; *S. Sessions*, Museum of Vertebrate Zoology, University of California at Berkeley; *G. Callard*, Harvard University; *S. Guttman*, Miami University; *J. Wiley*, N.C. State University; and *R. Hall*, U.S. Fish and Wildlife Service.

The museum will host the 1982 joint meetings of the Society for the Study of Amphibians and Reptiles and

the Herpetologists League, to be held in Raleigh on August 1-6, 1982. This will be the 25th anniversary meeting of the SSAR.

MISCELLANEOUS

Permit Necessary for Collecting Cave Organisms. Recent *cave protection acts* enacted in both Virginia and West Virginia make it illegal to collect organisms from caves without a scientific collecting permit. Several other states have either recently passed, or are considering passing, similar legislation. The Virginia Act pertaining to biological policy reads (in part): "It shall be unlawful to remove, kill, harm, or otherwise disturb any naturally occurring organisms found within any cave, except for safety reasons; provided, however, scientific collecting permits are obtained." The wording of the West Virginia section on biology policy is similar. In both states, a person who violates any provision of the section shall be guilty of a misdemeanor.

Biologists can obtain applications for collecting permits for Virginia by writing to: Virginia Cave Commission, P.O. Box 7007, Richmond, Virginia 23221; and for West Virginia by writing to: Chief, Law Enforcement Division, Dept. of Natural Resources, 1800 Washington St., E., Charleston, West Virginia 25305.

Vascular Flora of the SE. U.S.—Project Revived! There has been a recent renewal of excitement and activity toward the completion of the Vascular Flora of the Southeast. The first volume *Asteraceae* by A. Cronquist, was published in 1980. Volume 2, to go to press in 1982, will include the Lower Vascular Plants, Gymnosperms, Magnoliidae, Hamamelidae, and Caryophyllidae. Family authors for this second volume are: L. Anderson, C. R. Bell, D. Boufford, J. Doyle, W. Duncan, W. Ernst, A. M. Evans, J. Fay, J. Hardin, J. Horton, F. James, C. Keener, R. Kral, A. Lindsey, R. Long, J. Luteyn, J. Massey, K. Nicely, T. Pullen, K. Robertson, D. Stone, J. Thieret, G. Tucker, A. Weakley, J. Wiersema, H. Wilson, and E. Wofford. The Editorial Board consists of: J. R. Massey, Chairperson; Earl L. Core, James W. Hardin, Albert E.

Radford, and John W. Thieret. Laurie S. Radford is Executive Editor. Botanists interested in contributing treatments of genera or families, or in reviewing manuscripts, should contact Dr. Massey, Department of Botany, University of North Carolina, Chapel Hill, NC 27514. A revised Contributor's Guide is available upon request.

JEMSS—Revived! On December 30, 1980, an agreement was signed between officers of the North Carolina Academy of Science and the Elisha Mitchell Scientific Society, turning control of the *Journal of the Elisha Mitchell Scientific Society* over to the Academy.

The members of the Academy have voted to make subscription to the *Journal* part of regular membership, and a new arrangement has been reached with the Library of the University of North Carolina at Chapel Hill concerning exchange copies of the *Journal*. These two developments put the *Journal* on sound financial ground.

The *Journal* is now sharing an office with the Academy at 203 Weaver Street in Carrboro, North Carolina. A new editorial board including scientists from a wide range of disciplines will be overseeing the production of the *Journal*. ASB members are reminded that the *JEMSS* publishes research papers from all areas of science, and by scientists both within and outside North Carolina. Each manuscript will be refereed by the most qualified reviewers available. Any ASB member who has a manuscript he would like to submit to the *Journal* should send it to Dr. Martha Jenner, Editor, *JEMSS*, Box 621, Carrboro, NC 27510; phone (919) 942-2552.

The *Journal* will be 100 years old in 1983. A celebration will be held on the UNC-Chapel Hill campus, with the Society, the Academy, the UNC-CH Department of History, and the Southern Association for History of the Sciences and Technology participating. A special centennial issue of the *Journal* is also planned. ASB members who have ideas for the celebration or the special issue are invited to contact Dr. Jenner.



59.06

QH301
.A78
*

The ASB

BULLETIN

Volume 28, Number 4

(ISSN 0001-2386)

October 1981



M
E
M
B
E
R
S
H
I
P

L
I
S
T

Wing Scales of a Butterfly

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Past President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

President Elect — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Vice-President — Donald J. Shure, Biology, Emory University, Atlanta, GA 30322

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Seawane, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059

Sharon Patton (1984), Veterinary Pathobiology, University of Tennessee, Knoxville, TN 37916

AAAS Representative, Section G —

Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

A Fresh Look at Climax Forests of the Coastal Plain ... <i>Elsie Quarterman</i>	143
Association Affairs	149
News of Biology in the Southeast	150
Index of Current Plant Research	154
ASB Membership List 1981	162

COVER

A scanning electron micrograph (original magnification ca. 950×) of wing scales from the little wood satyr, *Euptychia cymela*. The three hair-like structures are actually a specialized type of scale. *Courtesy of Roger Boettcher, Louisiana State University.*

TIME AND PLACE OF FUTURE MEETINGS

1982	April 14-17	Eastern Kentucky University, Richmond
1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984	April	Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Company, Greenville, SC



A FRESH LOOK AT CLIMAX FORESTS OF THE COASTAL PLAIN¹

Elsie Quarterman

Box 1313 Belmont Park Ct.
Nashville, TN 37215

Nineteen years ago, Catherine Keever and I published a paper entitled "The Southern Mixed Hardwood Forest: Climax in the Southeastern Coastal Plain, USA," in which we concluded there was a generalized type of forest common to mesic sites throughout the area. We hoped that, among other things, the publication would stimulate further research on hardwood forests of the region. It seems worthwhile now to look again at conclusions of our study in the light of more recent ecological analyses, of both past and present vegetation of the same region.

The area studied was essentially that mapped by Braun (1950) as the Southeastern Evergreen Forest Region. Since our objectives had to do with mesic sites, stands on obviously dry sites such as sandhills and on obviously wet sites such as bayheads, first bottoms, and swamps were excluded. Magnolia-beech stands, previously proposed as climax for northwest Florida (Gano 1917; Kurz 1944), were found to be on wet, not mesic, sites, with the overstory individuals often occurring on hummocks that lifted them above the saturation level.

Vegetational analysis of 30 sampled stands plus listing in 63 additional stands offered evidence that the Southern Mixed Hardwood Forest is dominated by several overstory species from a list of 14 that we called Group I. These are *Fagus grandifolia*, *Quercus laurifolia*, *Magnolia gran-*

diflora, *Quercus alba*, *Liquidambar styraciflua*, *Carya tomentosa*, *Quercus nigra*, *Q. falcata*, *Carya glabra*, *Nyssa sylvatica* var. *dilatata*, *Ilex opaca*, and *Pinus taeda*. Of these, *Fagus*, *Magnolia*, *Quercus alba*, *Carya glabra*, and *Nyssa sylvatica* var. *dilatata* have the highest fidelity (*sensu* Braun-Blanquet 1932) to mesic sites. In addition, co-dominants may include any of several "characteristic" species (Group II), namely, *Pinus glabra*, *Acer barbatum*, *Quercus michauxii*, *Tilia* spp., *Carya pallida*, and *Fraxinus americana*.

We found sufficient similarity in stand structure and composition throughout the region to consider the complex hardwood forests on mesic uplands of the entire southeastern Coastal Plain a single association of the Eastern Deciduous Forest, and enough successional evidence to consider it the penultimate, if not ultimate, forest type of the region.

Since 1962, a number of papers have been published dealing with vegetation of the southeastern Coastal Plain. I would like to review these briefly.

Monk (1965, 1966a, 1966b, 1967, 1968; Monk and Brown 1965) published papers dealing with forests on sites of varied moisture conditions in north central Florida, near the center of best development of the Southern Mixed Hardwood Forest. His area overlaps ours and extends south to Hernando and Volusia Counties (Monk 1965). He was interested in both occurrence and in character of stands as influenced by site. He considered Southern Mixed Hardwoods, Mixed Hardwood Swamps, Bayheads, Sand Pine Scrub, Pine Flatwoods, and Cypress Heads to be the major forest types (Monk 1968). He called

¹ Presented at the luncheon meeting of the Southeastern Section of the Ecological Society of America, April, 1981, in conjunction with the 42nd Annual Meeting of the Association of Southeastern Biologists, Knoxville, TN.

the first three climax on upland, wet fertile and wet acid sites, respectively, and the latter four successional. With release from fire, succession proceeds toward one of the three climaxes, depending on soil moisture and fertility.

Results of Monk's investigations of mesic site characters showed that mixed hardwood forest was best developed on soils high in calcium and phosphates, with a higher degree of evergreenness occurring when Ca, K, P and moisture equivalent are low (Monk 1968). Hardwood stands were scarce east of the Central Ridge and south of the Okefenokee, which he attributed to unfavorable habitats and to obstruction by the swamp of southward migration of species (Monk 1965). He characterized the Southern Mixed Hardwood Forest as closer to the Eastern Deciduous Forest than to Subtropical Forest, and typified it by its inclusion of the evergreen character and its tendency toward an "undifferentiated climax" (Monk 1965).

Clewell (1971) studied 17 forest types present on the Appalachian National Forest. He described Southern Mixed Hardwood Forests as occurring principally "on bluffs and high terraces in river systems and on flat uplands in the Woodville Karst Plain in the Sopchoppy-to-Wood Lake area" . . . with "an occasional zone of mesic hardwoods . . . between creek swamps and bay swamps near creeks with gently sloping basins." He, as well as others working in the Tallahassee area, takes issue with the climax position of Southern Mixed Hardwood Forest, indicating that longleaf pine forests, maintained by lightning-set fires, bayheads, savannahs, and perhaps others are also stable, self-reproducing communities that might be termed climax. Note that his hierarchical classification of climax types differs from that of Monk (1965, 1968). I agree that there are a number of topo-edaphically maintained forest types in the southeastern Coastal Plain and have no problem with calling some of them climax. Keever and I elected to study one

habitat type, mesic uplands, on the assumption that if a regional climax existed it must occur on the most mesic sites available. We, therefore, have no data on the degree of stability of other forest types. I also agree that lightning-set fires are a natural phenomenon and that longleaf pine appears to require interaction of good seed years, season of burning, and appropriate length of interval between fires. Watts (1971) found little evidence from fossil pollen studies to support the longleaf pine fire-climax theory, although his evidence suggests that longleaf pine may have dominated the Coastal Plain for the last 5000 years. He attributes prehistoric changes in dominance to increases in soil moisture levels. Accepting fire as an influencing factor, however, does not preclude the possibility that sufficiently long periods of time between fires could occur for Southern Mixed Hardwood stands to become established. Once established, they tolerate burning and other kinds of disturbance short of complete destruction. Wharton (1978) quotes personal communications from Komarek of the Tall Timbers Research Station to the effect that hardwood forests do withstand repeated fires. Doren, Wooten, and Godfrey (1973) collected data on beech reproduction in Thomas County, Georgia four years after a wildfire in a hardwood forest in which beech and magnolia were sporadically dominant; of 576 beech seedlings counted on three 30-ft-diameter plots, 554 were four years old. In contrast, there were 20-60 beech seedlings in comparable samples in three unburned stands. This strongly suggests a positive effect of fire on beech establishment in the Coastal Plain rather than a negative one! Blaisdell, Wooten, and Godfrey (1973), after sampling five stands in the Tallahassee, Florida-Thomasville, Georgia area, concluded that, if fire is excluded from non-flooded sites, the "eventual development of a Magnolia-beech forest would seem to be inevitable." Only one of their five stands is presently dominated by magnolia and beech, and it is a lowland

site. Three of the other four, however, do show a strong developing understory of magnolia and beech. The fourth, a hardwood stand cut 24 years before their study, was dominated by *Liquidambar* with a strong understory of *Magnolia*, *Quercus nigra*, *Carya*, *Fagus*, *Quercus prinus* (*Michauxii*), with *Liquidambar* of lesser importance. This study fails to convince me of a Magnolia-beech climax in the Tallahassee-Thomasville area.

Wharton (1978) described several Southern Mixed Hardwood stands in the Coastal Plain of Georgia, concentrating on forests on bluffs and in ravines, but including several on mesic to dry uplands. His interests were more floristic than ecological, and he did not deal with climax status, *per se*.

Several studies dealing with mixed hardwood forests lie beyond the major part of the range of *Magnolia grandiflora* and *Quercus laurifolia*, two important codominants of the Southern Mixed Hardwood Forest. Sechrest and Cooper (1970) found that upland Coastal Plain stands in Moore County, North Carolina were not comparable to the Southern Mixed Hardwood Forest, but were more closely related to the Oak-Hickory association of the Piedmont. Nesom and Treiber (1977) interpreted beech-mixed hardwood stands in the North Carolina Coastal Plain as floristically depleted post-glacial relicts more characteristic of Piedmont and mountain areas rather than as "advance disjuncts" of the Southern Mixed Hardwood Forest. Hartshorn (1977), however, after studying forest and site relationships in Beaufort County, North Carolina, concluded that his study area should be included in the Southern Mixed Hardwood Forest of Quarterman and Keever (1962).

Ware (1970) found that a stand on the Virginia Coastal Plain exhibited a strong relationship to Southern Mixed Hardwood Forests in spite of the absence of *Quercus laurifolia* and *Magnolia grandiflora*.

At the western end of the Southern Mixed Hardwood Forest region, a number

of rather detailed studies have been done. McLeod (1971) lists as dominants of the more elevated areas of the Big Thicket of Texas, loblolly pine, southern magnolia, white oak, and beech, with white oak replaced by laurel oak on lower sites. He appears to be in rather close agreement with us on both dominant and accessory species. He indicated that this forest type would reach its southwestern limit with that of beech in western Montgomery County, Texas (McLeod 1975). In 1980, Nixon *et al.* found that an old-growth mesophytic community in Sabine County, Texas contained 11 of Quarterman and Keever's (1962) 14 core species, differing principally in the preponderance of beech and abundance of *Carpinus*.

Marks and Harcombe (1975) dealt with reasons for diversity within and between stands in the Big Thicket. After sampling 12 stands on sites ranging from xeric through mesic (Southern Mixed Hardwoods) to bottomland, they conclude that a long topographic-moisture gradient accounts for between-habitat diversity, while high within-habitat diversity is attributable to a large number of shrub species. In a study concerned with stability of climax forests, Harcombe and Marks (1978) dealt with replacement processes through examining tree diameter distributions in various size classes in mesic and wet Big Thicket stands. They found underrepresentation of saplings of dominant overstory species. After considering several possible explanations, they attributed this phenomenon to competition within the understory layer. They propose that creation of multiple crown gaps mitigates effects of competition and allows replacement of overstory dominants. In the same paper, they propose that succession is primarily an old-field phenomenon that does not occur in forests on sites not previously cleared. I take issue with them on this point. To me, succession is as close to a natural law as is any contribution of ecology. Perhaps their view represents a rather short time-scale,

a common error among those who question the validity of succession. Another stumbling block to many, strangely enough, is that they equate succession to the rapid, clear-cut replacement of dominants such as occurs in old fields of Piedmont, North Carolina. Failing to see such a sharply defined sequence in other geographic areas, they abandon the whole concept, instead of recognizing that succession is the tendency of vegetation to invade and occupy open habitats and to proceed through changes of dominants, whether rapid or slow, and in spite of autogenic changes in the environment, toward a relative steady state.

So far in this review, studies of presently existing vegetation support the general description of the Southern Mixed Hardwood Forest and its climax status, with the exception of those conducted in the Tallahassee-Appalachicola area. The question of Magnolia-beech dominated stands is troubling. Braun (1950) recognized it, but in personal communications on the subject, was more than willing to broaden the concept of dominance in mesic Coastal Plain stands. Perhaps Magnolia-beech is an association-segregate of Southern Mixed Hardwoods near the sub-hydric end of the moisture gradient. The definition of "mesic" may be called into question here, as well. Keever and I were rather strict in defining mesic because of the common belief that southern hardwoods were all bottom-land species. Wharton (1978) describes a stand (Magnolia Bluff, Camden Co.) as "very mesic," explaining that it is "so wet that magnolias . . . grow side by side with floodplain species such as water hickory and cypress." I would *not* call such a site mesic.

One tends to wish for some knowledge of the original forests. Hazel and Paul Delcourt, using Land Office Surveys, studied pre-settlement forests in the Southern Mixed Hardwood Forest region. They show a Magnolia-holly-beech climax in West Feliciana Parish, Louisiana (H. Delcourt and P. Delcourt 1974) and a Magnolia-beech climax on the Appalachicola River bluffs in Florida (H. Delcourt and P. Delcourt 1977) in the early 1820's. They project that the Magnolia-beech forest type was scattered throughout the Southern Mixed Hardwood Forest region on "hammocks"; *i.e.*, mesic sites and, since these were representative of mature vegetation of such sites available within the floristic region comprised of overlap ranges of magnolia and beech, they consider them to typify this climax region. They agree with Quarterman and Keever (1962), however, that the modern hardwood forests of the southeastern Coastal Plain appear to be converging toward a more complex forest type with Magnolia-beech as one variation within a somewhat more widespread climax type, influenced by changes in environmental variables brought about by modern man's activities.

Several papers (H. Delcourt and P. Delcourt 1975; P. Delcourt and H. Delcourt 1977, 1979; Delcourt *et al.* 1980) shed light on the probable source of at least some of the hardwood species in the Coastal Plain. Fossil pollen records provide evidence for a bluffslands refugium and migration route on the loess hills along the Mississippi River, with the Tunica Hills representing the southern terminus. The Delcourts hypothesize that contact of cold, glacial melt-water down the Mississippi with warmer, moist, Gulf air created a cool, foggy climate, which coupled with the optimal edaphic conditions of the loess soils, promoted southward migration of species of the Mixed Mesophytic Forest along the loess bluffs, from which they spread laterally into suitable habitats of the Coastal Plain. The same potential must have obtained along rivers draining from the Appalachian Mountains to the Atlantic and Gulf coasts. Watts (1971) proposes that *Fagus* either invaded or built up populations in south Georgia in late post-glacial times and from there moved into Florida, where it is an invading species, not a relict.

In reviewing papers on full-glacial and

post-glacial vegetation of southeastern United States (Watts 1971; Delcourt 1980; Delcourt and Delcourt 1975, 1979; Delcourt *et al.* 1980). I find that from 26,000 yr. BP through full-glacial and late glacial time until about 5000 yr. BP, the climate in the Coastal Plain favored oak-hickory-pine (Delcourt 1980) or oak scrub with scattered prairie elements (Watts 1971) occurring south of forests of spruce and jack pine, with a transition zone across central Alabama and Georgia (Delcourt 1980). At about 5000 yr. BP, the modern vegetational history of southeastern United States began, when oak-hickory forest shifted to longleaf pine dominance with an increase in the number of broad-leaved tree species (Delcourt 1980; Watts 1971). Pollens of *Nyssa biflora* and *Liquidambar* types appeared, then the presence of *Gordonia*, *Viburnum*, *Ilex*, and members of the Ericales gave clear evidence of the development of bayheads. Forests became more mesic and diversified with *Fagus*, one of the indicator species of the Southern Mixed Hardwood Forest, becoming abundant (Delcourt 1980; Watts 1971), along with *Ostrya/Carpinus*, *Celtis*, *Juglans*, *Vitis*, and with *Taxodium* expanding. Development of bayhead, cypress swamp, and mesic hammock vegetation occurred during late post-glacial time.

The present vegetation, then, has developed during the last 3000–5000 years, repeating in part the cycles of oak-hickory to pine that also occurred during the last interglacial period (Watts 1971). Watts considers it astonishing that highly complex ecosystems can come into being over such very short periods of time. Note that 3000–5000 years is considered a short period of time from his perspective, whereas some ecologists seem to expect successional or cyclical changes to be completed within observable time!

The cyclical nature of vegetation in the southeast through the last interglacial and into post-glacial time has a bearing on the interpretation of existing ecosystems as

well as on the climax concept itself. The shifts from oak-hickory to pine and back to oak-hickory then pine again and now to hardwoods controlled largely by changes in available moisture (Watts 1971), suggest that vegetation is developing into a more mesic and diverse phase than has occurred before, resulting in the appearance of the climax type called Southern Mixed Hardwoods by Quarterman and Keever (1962), with local sub-hydric sites dominated by a *Magnolia-beech* segregate and hydric sites by bayheads and hardwood swamps. Other forest types are probably successional (Monk 1968), although long periods of time may be involved in effecting normal successional changes, and modern man may scramble all of the above.

To summarize briefly: the margins of the Southern Mixed Hardwood Forest region and the overall composition of the forest type remain essentially the same. Some of the questions with which we started in 1962 still need further attention, *e.g.*, fire. Future palynological investigations with emphasis on the search for charcoal, and experimental work on effects of fire on hardwood reproduction are needed. Care in definition of the term “mesic” is necessary for comparative reasons. The chief contribution of our 1962 paper remains the same; *i.e.*, the widespread geographic position of the forest described as Southern Mixed Hardwoods. It is the web that links the Coastal Plain uplands from east to west.

LITERATURE CITED

- Blaisdell, Robt. S., Jean Wooten, and R. K. Godfrey. 1973. The role of magnolia and beech in forest processes in the Tallahassee, Florida, Thomasville, Georgia area. Proc. Annual Tall Timbers Fire Ecology Conf.
- Braun, E. Lucy. 1950. Deciduous Forests of Eastern North America. The Blakiston Co., Philadelphia. 596 pp.
- Braun-Blanquet, J. 1932. Plant Sociology. Transl. by G. D. Fuller and H. S. Conard. McGraw-Hill. New York. 439 p.
- Clewell, A. F. 1971. The vegetation of the Appalachian National Forest: an ecological perspective.

- Office of the Forest Supervisor, USDA Forest Service, Tallahassee, Fla.
- Delcourt, Hazel R. and Paul A. Delcourt. 1974. Primeval magnolia-holly-beech climax in Louisiana. *Ecology* 55: 638-644.
- . 1975. The Blufflands: Pleistocene pathway into the Tunica Hills. *Amer. Midl. Nat.* 94: 385-400.
- . 1977. Presettlement magnolia-beech climax of the Gulf Coastal Plain: Quantitative evidence from the Appalachicola River bluffs, north-central Florida. *Ecology* 58: 1085-1093.
- Delcourt, Paul A. 1980. Goshen Springs: Late Quaternary vegetation record for southern Alabama. *Ecology* 61: 371-386.
- Delcourt, P. A. and H. R. Delcourt. 1977. The Tunica Hills, Louisiana-Mississippi: late-glacial locality for spruce and deciduous forest species. *Quat. Res.* 7: 218-237.
- . 1979. Late Pleistocene and Holocene distributional history of the deciduous forest in the southeastern U.S. *Veröff. Geobot. Inst. ETH, Stiftung Rübel, Zurich* 68 Heft (1979): 79-107.
- Delcourt, P. A. *et al.* 1980. Quaternary vegetation history of the Mississippi Embayment. *Quat. Res.* 13: 111-132.
- Doren, Robt. F., Jean Wooten, and R. K. Godfrey. 1973. In Blaisdell, Robt. F., Jean Wooten, and R. K. Godfrey. The role of magnolia and beech in forest processes in the Tallahassee, Florida-Thomasville, Georgia area. *Proc. Annual Tall Timbers Fire Ecology Conf.*
- Gano, Laura. 1917. A study in physiographic ecology in northern Florida. *Bot. Gaz.* 63: 337-372.
- Harcombe, P. A. and P. L. Marks. 1978. Tree diameter distributions and replacement processes in southeast Texas forests. *For. Sci.* 24: 153-166.
- Hartshorn, G. S. 1977. Vegetation and soil relationships in southern Beaufort Co., N.C. *Jour. Elisha Mitchell Sci. Soc.* 88: 226-238.
- Kurz, H. 1944. Secondary forest succession in the Tallahassee Red Hills. *Proc. Fla. Acad. Sci.* 7: 1-100.
- Marks, P. L. and P. A. Harcombe. 1975. Community diversity of coastal plain forests in southern east Texas. *Ecology* 56: 1004-1008.
- McLeod, C. A. 1971. The Big Thicket of east Texas. *Texas Jour. Sci.* 23: 221-233.
- . 1975. Southwestern limit of *Fagus grandifolia* Ehrh. *Texas Jour. Sci.* 26: 179-184.
- Monk, C. D. 1965. Southern mixed hardwood forests of north central Florida. *Ecol. Monogr.* 35: 335-354.
- . 1966a. An ecological study of hardwood swamps in north central Florida. *Ecology* 47: 649-654.
- . 1966b. An ecological significance of evergreenness. *Ecology* 47: 504-505.
- . 1967. Tree species diversity in the eastern deciduous forest with particular reference to north central Florida. *Amer. Midl. Nat.* 101: 173-187.
- . 1968. Successional and environmental relationships of the forest vegetation of north central Florida. *Amer. Midl. Nat.* 79: 441-457.
- Monk, C. D. and T. W. Brown. 1965. Ecological considerations of cypress heads in north central Florida. *Amer. Midl. Nat.* 74: 126-140.
- Nesom, G. L. and M. Treiber. 1977. Beech-mixed hardwoods community: a topoedaphic climax on the North Carolina Coastal Plain. *Castanea* 42: 119-140.
- Nixon, E. S., K. L. Marietta, R. O. Littlejohn, and H. B. Weyland. 1980. Woody vegetation of an American beech (*Fagus grandifolia*) community in eastern Texas. *Castanea* 45: 171-180.
- Quartermann, Elsie and Catherine Kever. 1962. Southern Mixed Hardwood Forest: climax in the southeastern Coastal Plain, U.S.A. *Ecol. Monogr.* 32: 167-185.
- Sechrest, C. G. and A. W. Cooper. 1970. An analysis of the vegetation and soils of upland hardwood stands in the Piedmont and Coastal Plain of Moore Co., N.C. *Castanea* 35: 26-57.
- Ware, Stewart A. 1970. Southern mixed hardwood forest in the Virginia Coastal Plain. *Ecology* 51: 921-924.
- Watts, W. A. 1971. Postglacial and interglacial vegetation history of southern Georgia and central Florida. *Ecology* 52: 676-690.
- Wharton, Chas. H. 1978. The Natural Environments of Georgia. Ga. Dept. Nat. Resources, Atlanta, Ga.

Association Affairs

FORTY-THIRD ANNUAL MEETING EASTERN KENTUCKY UNIVERSITY RICHMOND, KENTUCKY April 14–17, 1982

ADVANCED PLANNING NECESSARY

1. See “**Call-for-Papers**” for various deadlines. The abstracts will be different this next year!
2. A **Pre-registration** form will be in the January issue. It will be to your advantage to pre-register for the 1982 meeting.
3. **Lodging accommodations.**

The large numbers of motels in cities of recent ASB meetings will not be available in Richmond, KY. It is recommended that housing arrangements be made as early as possible.

- On-campus housing will not be available.
- Campground information will appear in the January issue.
- Listed below are recommended accommodations.
- The rates are for 1981 and they are subject to change.
- The number of rooms for each motel indicates the number presently being reserved for this meeting.
- Most important:** when making reservations, indicate that you are attending the ASB meeting.

In Richmond, Kentucky:

DAYS INN

I-75, Exit 90 (Exit 90-A if traveling south on I-75)
(606) 623-0880 Toll-Free 1-800-241-9191
100 rooms reserved
1 person = \$18.00
2 people = \$25.02

HOLIDAY INN

Eastern By-Pass, Exit 87 from I-75
(606) 623-9220 Toll-Free 1-800-238-5400
100 rooms reserved (Group rates for ASB)

1 person = \$27.00

2 people = \$35.00

KNIGHTS INN

I-75 Exit 90 (Exit 90-A if traveling south on I-75)
(606) 624-2612

75 rooms reserved (Group rates for ASB)

1 person = \$18.00

2 people = \$23.50

PENNY PINCHER INN

Eastern By-Pass, Exit 87 from I-75
(606) 623-8126 Toll-Free 1-800-447-4470
65 rooms reserved (Group rates for ASB)

1 person = \$18.99

2 people = \$22.99

THRIFTY DUTCHMAN

Eastern By-Pass, Exit 87 from I-75
(606) 623-8813

75 rooms reserved

1 person = \$17.85

2 people = \$18.90

Rooms need to be paid in advance.

Near Richmond, Kentucky:

SHERATON INN

I-75 at Athens-Lexington Exit; 17 miles north of Richmond

(606) 269-4341

50 rooms reserved

1 person = \$40.00

2 people = \$45.00

Confirmation of reservations need to be made one month before meeting or else they will be released. Overnight deposit is required.

BOONE TAVERN HOTEL (Nationally known for regional food)

Main Street, Berea; 15 miles south of Richmond

To reserve call Ms. Lucy Nelson, (606) 622-1444 or write her in care of Eastern Kentucky University, Richmond, KY 40475.

20 rooms reserved

Singles = \$18.00–35.00

Doubles = (1 bed) = \$23.00–30.00

Doubles = (twins) = \$28.00–30.00

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE AND PLACES

Alabama

Tuskegee Institute, Department of Biology. *Dr. Shogo Yamaguchi* was recently recognized for his accomplishments at a dinner held at the Holiday Inn. The evening was highlighted by the presentation of a W. Kelly Mosley Environmental Award, consisting of a plaque and a \$500 check. *Dr. Harry S. Larson* presented the award. Since coming to the biology department in 1965, *Dr. Yamaguchi* has selflessly given of his time and energy to make Tuskegee a nicer place for all of us to live. He has been a catalyst in efforts to establish the Bartram Trail through the Tuskegee National Forest. He has served as Director of the department's greenhouse, and made plants available to the city for beautification. *Dr. Yamaguchi* retired at the end of the spring semester 1981.

Florida

University of Miami, School of Marine and Atmospheric Science. *Dr. Claes G. H. Rooth*, Professor of meteorology and physical oceanography, is Acting Director of the Cooperative Institute for Marine and Atmospheric Studies, a research institute established in 1977 by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and the University of Miami. *Dr. Rooth* replaces *Dr. Eric B. Kraus*, the first Director of CIMAS, who retired from the faculty in March 1981. *Claes Rooth* has been a Fellow of CIMAS since its inception. His research interests span a range from the physics of atmospheric clouds to the near-bottom mixing processes in the abyss of the oceans.

The Florida State University, Department of Biological Sciences. The department has been designated a Center of Excellence program in the State University System. *Professors Gerald Schatten* and *Marc Freeman* have been awarded Career Development awards by the NIH. *Professors Harry Lipner* and *Lloyd Beidler* will be on leave of absence in the Spring of 1982. *Dr. E. I. Friedmann* has just returned from a trip to the Antarctic continuing his studies of endolithic algae in the dry valleys. Professor *Martin Roeder*, Associate Chairman for Undergraduate Studies, has been elected

President of the Florida Conference of the A.A.U.P. and President of the Sigma Xi chapter at FSU. *Dr. Avraam Grossman* is completing two years as a Postdoctoral Fellow in *R. B. Short's* laboratory. Professor *Kurt Hofer* was chosen to receive the President's award as outstanding teacher in the University. *Dr. William Herrnkind* has been made Director of the University's Ed Ball Marine Laboratory at Turkey Point, Florida. *Dr. Michael Greenberg* has resigned his position to accept the Directorship of the Whitney Marine Laboratory at St. Augustine, and *Professor Norris Williams* is leaving to join the staff of the Florida State Museum at Gainesville. Recent additions to the faculty include: *Dr. William Outlaw*, Associate Professor, who joins from Washington University in St. Louis; *Dr. Ross Ellington*, Assistant Professor, joining from Southwestern Louisiana University; *Dr. Joe Travis*, Assistant Professor, who comes to us from Duke University; *Dr. Tom Roberts* who joins as an Assistant Professor from the Carnegie Institution of Washington; *Dr. Malcolm Potts*, Assistant Professor, who is completing two years of postdoctoral studies with *E. I. Friedmann* and who has his degree from the University of Durham in England; *Dr. Michael Meredith* joins as an Associate in Research and comes from the Worchester Foundation; *Dr. Byung Dong Kim* also is an Associate in Research and comes from the J. Hillis Miller Health Center in Gainesville; *Dr. Gerard Gorniak*, Assistant Professor, joins the department and the Program in Medical Science, from the University of Michigan.

Georgia

University of Georgia, Botany Department. *Nancy C. Coile* has been appointed Curator of the Herbarium. All correspondence concerning loans, exchanges, and gifts to the Herbarium should be addressed to Mrs. Coile. *Dr. Samuel B. Jones* has been appointed Director of the Herbarium and will continue his research on the Vernoniae (Compositae).

Agnes Scott College, Department of Biology. *M. Eloise Brown Carter*, a member of the department, is the recipient of an AWIS Educational Foundation Award in honor of *Julia T. Apter*, presented by the Association for Women in Science.

Louisiana

Northwestern State University, Department of Biology. *Dr. Dwayne Kruse* recently received a grant from the Louisiana Board of Regents for Higher Education

to establish baseline data on the water quality and variety of organisms in Bayou Pierre. Tri-Beta members took their annual Easter field trip this year to the deserts of southwestern United States and included Carlsbad Caverns, Grand Canyon, Painted Desert, and Petrified Forest in the tour. *Dr. Arthur Allen, Linda Lin, and Dr. Thomas Burns* presented papers at the Louisiana Academy of Sciences at a recent meeting.

University of Southwestern Louisiana, Department of Biology. The following promotions are effective the fall semester of 1981: *Dr. Betty E. Lemmon* and *Dr. Sydney P. Craig III* have been promoted to the rank of Professor of Biology. *Dr. Roy C. Brown* has been promoted to the rank of Associate Professor of Biology. New faculty and staff include: *Dr. Steven C. Hand* will join the department as an Assistant Professor in January 1982. He is presently completing postdoctoral studies at the Scripps Institute of Oceanography. *Dr. Robert G. Jaeger*, formerly at SUNY, Albany, has joined the faculty as an Assistant Professor of Biology. *Garrie P. Landry* joined the faculty as a Laboratory Assistant. *Dr. Roy C. Brown* is the Director of the new Electron Microscopy Center located in the new wing of the biology building.

Newcomb College, Department of Biology. *Dr. Joan Bennett* has been promoted to Professor of Biology. Her studies on the genetics and biochemical properties of aflatoxin has led to several invitations to develop papers on secondary metabolism. Newcomb College and College of Arts and Sciences of Tulane University have developed a new curriculum broadening the education of all liberal arts students. A course in mathematics and three in science are required, and the biology department offers several introductory courses for students curious about science as well as a basic two semester course in general biology.

Loyola University, Department of Biological Sciences. *Dr. Walter G. Moore* has retired from the faculty. *Dr. Moore* was a member of the faculty since 1940. *Dr. Michael Willig* has joined the department as an Assistant Professor. *Dr. Willig* received his Ph.D. in ecology from the University of Pittsburgh.

Mississippi

Gulf Coast Research Laboratory, Ocean Springs. *Dr. Lionel Eleuterius*, Head of the botany section, recently presented two papers at the Eighth Annual Conference on Wetlands Restoration and Creation. The papers were entitled "Colonizing Patterns, Displacement, and Vegetational Succession of Tidal Marsh Plants Established on Dredged Spoil," and "Long Term Observations on Seagrass and Salt Marsh Established from Trans-plants." *Harriet Perry, John Ogle, and Allison Perry* assisted in conducting a blue crab workshop sponsored by the Texas Agriculture Extension Service on the Galveston campus of Texas A&M University. Bids were received for the official residence for the executive officer of the Gulf Coast

Research Laboratory on the main campus in Ocean Springs. Approximately 3700 square feet of space will be contained in the residence. *Dr. Sally Richardson*, an associate ichthyologist, has accepted an appointment to the editorial board of the U.S. Department of Commerce publication *Fishery Bulletin* for 1981-83. She has served on the board since 1976. *Dr. Edwin W. Cake, Jr.*, Head of the oyster biology section, has been appointed by the National Shellfisheries Association to serve as an associate editor of the new *Journal of Shellfish Research*.

North Carolina

North Carolina State University, Department of Botany. *Dr. Udo Blum*, Professor of Botany, was appointed Editor-in-Chief (North and South America) of the *International Journal of Biometeorology* published by the International Society of Biometeorology.

North Carolina State University, Department of Zoology. *Dr. Jeffrey Walters* will join the faculty as an Assistant Professor of Zoology. *Dr. Walters* is an ornithologist trained at the University of Chicago and the University of California, Berkeley. His specialty is avian behavioral ecology and he will be working primarily with shore birds. *Dr. John G. Vandenberg*, Head of the department, has been elected President of the Animal Behavior Society for the year 1982-83. *Dr. William C. Grant*, Associate Professor, was one among four faculty members selected as outstanding teachers from the School of Agriculture and Life Sciences during the academic year 1980-81. *Dr. Grover C. Miller*, Professor of Zoology, has been elected as President of the Gamma Sigma Delta for 1982-83. This is an honorary society promoting excellence in agricultural and life sciences. *Dr. Jay D. Hair* has resigned his position as Associate Professor and will assume the position as Executive Vice President of the National Wildlife Federation in Washington, D.C. In this position he will direct the activities of the largest private conservation organization in the United States.

North Carolina State University, Department of Horticultural Science. *Dr. D. Mason Pharr* was recently promoted to the rank of Professor. The following faculty were promoted to the rank of Associate Professor with permanent tenure: *Dr. Frank A. Blazich, Dr. Wanda W. Collins, and Dr. M. A. (Kim) Powell*. The following faculty have had changes in their assignments: *Dr. L. George Wilson* will assume responsibility for extension programs in post-harvest of vegetables; *Dr. Walter A. Skroch* will assume responsibility for weed control of all perennial crops; *Dr. Barclay Poling* will devote full time to small fruit culture research, teaching, and extension, and *Mr. Larry Bass* will be responsible for home horticulture and 4-H programs. *Dr. Mary M. Peet* was awarded a \$550 travel grant from the American Society of Plant Physiologists and a \$500 travel grant from the Botanical Society of

America to participate in the XIII International Botanical Congress in Sydney, Australia. She will present a paper on photosynthetic rates and dry weights of soybeans. *Dr. Mikal E. Saltveit* recently attended a NATO Advanced Study Institute on Post-harvest Physiology and Crop Preservation at Sounion, Greece. *Dr. James C. Raulston* and *Mr. Willard E. Hooker* are leading tour groups through gardens in Western Europe this summer. *Ann Herriot*, a graduate student in the department, received the "Outstanding Teaching Assistant Award" for the School of Agriculture and Life Sciences at NCSU.

East Carolina University, Department of Biology. *Dr. Mark M. Brinson* was recently promoted to the rank of Professor. He has been in the department since 1973. He is active in swamp forest and estuarine research and is a member of the Rivers Advisory Committee of the Conservation Foundation. He recently assumed duties as Director of graduate studies in the department.

Wake Forest University, Department of Biology. *Dr. Walter S. Flory*, Babcock Professor of Botany Emeritus, gave the Centennial Founder's Day Convocation Address at Bridgewater College in April, 1981. At the Annual President's Dinner, Flory was presented an Outstanding Service Award from Bridgewater, a school of which he is an alumnus and also a Life Trustee. At the 59th Annual Meeting of the Virginia Academy of Sciences, Dr. Flory was elected an Honorary Life Member. He is a Fellow and Past President of the Academy. *Dr. Raymond E. Kuhn*, Professor of Biology, has received a NSF Grant for a trip to Medellin, Colombia, SA for the purpose of establishing long-term collaboration with biologists and physicians at the Universidad de Antioquia. The proposed research will be on immunoparasitological studies of patients with Chagas' disease and leishmaniasis.

University of North Carolina at Chapel Hill, Department of Botany. *Joseph Edison Adams*, Professor Emeritus of Botany, died Sunday, June 7th, 1981 at North Carolina Memorial Hospital following a heart attack. Adams, who was 77, taught at UNC from 1935 to 1969. He was a specialist in the taxonomy of vascular plants, and was nationally known as co-author of the textbook, "Plants: An Introduction to Modern Botany." The text, co-authored with *V. A. Greulich*, is widely used in the United States and has been translated into several foreign languages. He also wrote extensively on plant anatomy and plant morphology. His lifelong research and graduate teaching interest was in the classification and phylogeny of flowering plants. His research and that of all his doctoral students was directed to that effort. He was a challenging and stimulating, as well as congenial, graduate advisor and seminar leader, an outstanding lecturer, superbly organized, articulate, a master of language, and an excellent writer. He was a provocative, pithy, professional scientist, who played a large role in the development and excellence of this department in the 40's

and 50's. He was a member of the N.C. Academy of Science, the Association of Southeastern Biologists, the Botanical Society of America, and the American Association for the Advancement of Science. Born in Middletown, N.Y., Adams received his bachelor's degree from the University of Michigan and his Masters from Columbia University. He received his doctorate from the University of California at Berkeley.

University of North Carolina at Charlotte, Department of Biology. A large private gift along with other gifts have been given to build a new greenhouse/conservatory complex. The complex will cost \$400,000 and will contain six different environmental regimens and a large headhouse. *Dr. Jeffrey Butts*, Associate Chairman of the department, has taken the position of Chairman of Biology at **Appalachian State University**. The North Carolina Academy of Sciences held their annual meeting on the campus at Charlotte in April, 1981. Two of the biology undergraduates won awards for outstanding research papers. Eight of the graduate students in the department won Sigma Xi awards to further their research efforts. An option in Medical Microbiology is now part of the graduate program.

Virginia

Old Dominion University, Department of Biological Sciences. The department is scheduled to implement a doctoral program in ecological sciences in August, 1982. A major goal of the program is to produce broadly trained ecologists able to conceptualize, coordinate, and supervise interdisciplinary studies on environmental problems and direct ecological research in industries, government agencies, or academic institutions. Resources supporting the program include a diverse faculty, well-equipped laboratories, and a variety of natural ecosystems located nearby. Financial support is available. For additional information write: *Dr. Frank P. Day, Jr.*, Director, Ecological Sciences Ph.D. Program, Department of Biological Sciences, Old Dominion University, Norfolk, VA 23508.

University of Richmond, Biology Department. *Dr. Warwick R. West, Jr.*, Chairman of the biology department, has been named a Fellow of the Virginia Academy of Science. West was one of four Fellows elected for contributions to science in research, teaching, and leadership, at the Academy's recent annual meeting. The others are *Dr. Frank Hereford*, President of the University of Virginia and a physicist; *Peter Mazzeo*, a senior botanist at the National Arboretum, and *Hubert Davis* of Portsmouth, a retired public schools science coordinator.

Virginia Commonwealth University, Department of Biology. Two new faculty have been appointed: *Dr. Jennifer Stewart* and *Ms. Catherine Corson*, replacing *Drs. Fred Landa* and *Loren Martin*.

Bridgewater College, Department of Biology. *Dr. Sarah E. Swank* has been appointed Assistant Professor of Biology. Dr. Swank received her Ph.D. from

the University of Southern California. Dr. Swank replaces *Dr. Harry G. M. Jopson* who has retired from teaching after 43 years at Bridgewater.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Florida

The John Young Science Center, Orlando. Effective May 1, 1981, the John Young Museum and Planetarium will have a new name: The John Young Science Center. According to Director *Mark E. Sinclair*, the modification of the name reflects the new direction in which the institution has been moving during the last several years. "We are not really a museum in the traditional sense of the word," says Sinclair. "The traditional museum is based around permanent collections, and its staff members use these collections to do scientific research."

"Our institution," continues Sinclair, "has no permanent collections and our exhibits are based around visitor participation. Rather than display cases filled with objects which cannot be touched, we have pulleys you can pull, computers that compute your risk of heart attack, and mirrors which bounce sound across a room. At the Science Center we encourage visitors to become involved, and in this respect we are very different from the typical museum."

Secondly, the main purpose of The John Young Science Center is education. According to Sinclair, the Center annually serves upwards of 140,000 people, including 20,000 school children, with educational programs and exhibits. The aim of the institution is to teach people about basic scientific principles. The Science Center continues to use the name of Orlando astronaut John Young. "All of us in the Central Florida community take great pride in the substantial contributions which John Young has made to the space program," says Science Center President *Betsy Holloway*. "We are honored to have his name associated with our facility."

Museum of Science and Space Transit Planetarium, Miami. *Erik Speyer* has been named Executive Director of the Museum of Science and Space Transit Planetarium. Mr. Speyer formerly was the Exhibits' Director at Planet Ocean where he designed and supervised exhibit installation and managed the marine facility. As the new Director of the Museum of Science he plans to completely renovate existing exhibit space by covering up two patios and removing non-bearing walls from the building. New exhibits will place a new emphasis on visitor participation. Speyer has his bachelor of arts degree in design, and his first job was with the Florida State Museum from 1962-66. He served as a navy pilot from 1966 to 1971. He currently lectures on the Naval Sea Power Program to civic groups and schools. He also paints land and sea-

scapes in watercolors, and his paintings have received numerous merit awards in both local and regional shows.

Georgia

University of Georgia Botanical Garden, Athens. *Dr. Samuel B. Jones, Jr.*, Professor of Botany and an expert in the identification and classification of plants, has been named Director of the university's Botanical Garden. Jones replaces *Dr. Michael Dirr* as Director of the 293-acre forest, which is used for teaching, research, service, and recreation. The garden is a preserve for both native and exotic plants, including some rare and unusual species. Jones is an authority on plant taxonomy and received his doctorate in botany from the University of Georgia. He is author or co-author of 94 articles and reviews, and coauthor of a book on plant taxonomy.

North Carolina

North Carolina State Museum of Natural History, Raleigh. During June, the museum conducted a workshop, "Experiences in Biological Field Research and Island Ecology," at the Forfar Field Station, Andros Island, Bahamas. Twenty-five North Carolina teachers of grades K through 8 worked with field biologists, and Bahamian teachers, studying the ecology of coral reefs, island forests, and caves. The workshop was funded by the Office of Educational Research and Improvement, U.S. Department of Education, and the NSF. *Ray E. Ashton, Jr.*, was the project Director. Cooperating researchers and educators included *Richard Franz*, Florida State Museum; *Lundie Mauldin*, University of North Carolina Sea Grant Program, and *T. K. Wilson*, Miami University. The second annual Natural History Symposium of the North Carolina Biological Survey is now in early planning stages. Scheduled for October 7-8, 1982, the symposium topic will be the biology of southeastern fishes of the genus *Notropis*. Researchers who desire to present papers are urged to contact one of the co-chairmen: *David S. Lee*, NCSM, P.O. Box 27647, Raleigh, NC 27611, or *Carter R. Gilbert*, Florida State Museum, University of Florida, Gainesville, FL 32611. A proceedings will be published. The Survey is a cooperative project between the State Museum and Plant Protection divisions of the N.C. Department of Agriculture. Through a cooperative agreement, the Biological Survey and the State Farm Operations division, NCDA, the museum has obtained access to a 1700-acre research site in the Sandhills of Hoke County. The tract is now being physically and faunistically surveyed, and will be used primarily for experiments in land management as related to maintenance of non-game animals and unique plant communities. Most of the area is longleaf pine-turkey oak communities, but bogs, pocosins, and floodplain forests are also present.

INDEX OF CURRENT PLANT SYSTEMATIC AND ECOLOGICAL RESEARCH IN THE SOUTHEASTERN UNITED STATES 1981-82

This constitutes the second registry. We want to thank those who responded to the mailing, and we anticipate another mailing after January 1, 1982. Again, please inform me of any errors resulting from either misreading your writing or misediting your project. Projects that appeared to be continuing were carried over to this year. New projects were added as submitted. *James F. Matthews, Department of Biology, University of North Carolina, Charlotte, NC 28223.*

GENERAL

Economic botany, general survey of poisonous plants and bibliographic indexing, K. D. Perkins, FLAS.

MULTIFAMILY STUDIES

Chemical components of *Brasenia schreberi* and *Nelumbo lutea*, J. W. Wooten, Univ. of Southern Mississippi, Hattiesburg, MS.

SEM study of leaf surface features and trichomes, J. W. Hardin, NCSU.

ALGAE

Phytoplankton of Dismal Swamp, Lake Drummond—population ecology, H. G. Marshall, ODU.

Synopsis of the freshwater algal genera of the southeastern U.S., G. E. Dillard, Western Kentucky, Bowling Green, KY.

FUNGI

POLYSTIGMATACEAE—ascus cytology and sporogenesis, H. R. Mainwaring, WCUH.

Higher marine fungi, ecology, marine Ascomycetes and Fungi Imperfecti, P. W. Kick, Jr., ODU.

BRYOPHYTES

AMBLYSTEGEACEAE—biometric, numerical taxonomy and systematics of *Hygroamblystegium*, R. Sutter, DUKE.

Moss flora of the Gulf Coast, W. D. Reese, LAF.

Bryophyte flora of Piedmont, SC, C. C. Douglass, CLEMS.

Bryophyte flora of tropical areas, floristic and revisionary, D. G. Griffin, FLAS.

LICHENS

Corticulous lichens on *Quercus prinus*, community and population ecology/competition for space, R. O. Lawton, HALA.

PTERIDOPHYTES

ASPIDACEAE

Dryopteris—spore biology, L. J. Musselman, ODU.

CYATHEACEAE—flavonoids survey, J. W. Wallace, WCUH.

GLEICHENIACEAE—chemotaxonomic, J. W. Wallace, WCUH.

HYMENOPHYLLACEAE—chemotaxonomic, J. W. Wallace, WCUH.

OPHIOGLOSSACEAE—floristics and taxonomy of southeastern species, R. D. Thomas, NLU.

Ophioglossum—biosystematics and floristics, W. R. Faircloth, VSC.

PTERIDACEAE

Pellaea wrightiana—species biology, J. F. Matthews, UNCC.

SPERMATOPHYTES

ALISMATACEAE

Sagittaria—systematic, J. W. Wooten, Univ. of Southern Miss., Hattiesburg, MS.

AMARANTHACEAE

Amaranthus hybridus/retroflexus—variation, distribution, identification, J. C. Murphy, NCSU.

APIACEAE—pollination ecology, reproductive biology, biosystematics of many genera, C. R. Bell and A. H. Lindsey, NCU.

APOCYANACEAE

Forsteronia, *Mandevilla*—systematics, revision, B. F. Hansen, USF.

AQUIFOLIACEAE—all genera, worldwide, T. R. Dudley, NA.

Family, phytogeography, floristics, revisionary of southeastern taxa, R. C. Clark, MOR.

ARACEAE

Arisaema—biosystematics, M. Treiber, US Army Engr. Topo. Labs, Ft. Belvoir, VA.

ARECACEAE—Arecoid palms, systematics and fruit anatomy, B. E. Young, USF.

ARISTOLOCHIACEAE

Hexastylis naniflora—population ecology, L. L. Gaddy, Walhalla, SC.

ASCLEPIADACEAE

Matalea—biosystematics, revision, biogeography, D. J. Drapalik, GAS.

ASTERACEAE

Aster avitus—phytogeography, population ecology, L. L. Gaddy, Walhalla, SC.

- Bidens*, section *Heterodonta*—revision, biosystematics, N. L. Wilson, MARY.
- Coreopsis*—biosystematic and chemosystematic, E. B. Smith, UARK.
- Eupatoriaceae, Cynareae—floristic, M. F. Johnson, VCU.
- Euthamia*—taxonomic revision, D. J. Sieren, WNC.
- Heterotheca subaxillaris*—population ecology, R. R. Sharitz, Savannah River Ecol. Lab., Aiken, SC.
- Senecio rugelia*—distribution and ecology, J. L. Collins, TVA Land and Forest Resources, Norris, TN.
- BERBERIDACEAE**
- Caulophyllum thalictroides*—biosystematic, J. F. Brett, OAC.
- CAESALPINIACEAE**—genera of SE US.—embryological, J. Benson, USCH.
- CAMPANULACEAE**—(particularly *Campanula*)—biosystematics, S. G. Shetler, US.
- CAPRIFOLIACEAE**
- Viburnum*—worldwide, T. R. Dudley, NA.
- CHENOPODIACEAE**
- Atriplex patula*—seed selection, G. F. Somers and J. L. Gallagher, DELS.
- CISTACEAE**
- Hudsonia montana*—biosystematics, reproductive biology, population status, R. D. Harbison, West. Piedmont Comm. Coll., Morganton, NC.
- COMMELINACEAE**
- Tradescantia* series *Virginianea*—systematic, D. T. MacRoberts, LSUS.
- CONVOLVULACEAE**
- Ipomoea* spp. in NC and SC—reproduction, pollination biology, R. L. Beckmann and J. M. Stucky, NCSC.
- CRASSULACEAE**
- Sedum*, sect. *Ternata*—biosystematics, flavonoids, SEM, P. J. Calie, TENN.
- CYPERACEAE**
- Carex* and *Cyperus*—biosystematics, revision, D. K. Evans, MUHW.
- Carex* spp.—phytogeography of SE species, L. L. Gaddy, Walhalla, SC.
- Carex albolutescens* complex—biosystematics, P. E. Rothrock, Montreat-Anderson College, Montreat, NC.
- Cyperus* sect. *Umbellati*—revisional, R. Carter, VDB.
- Cyperus*—monographic, floristic of N. Am., J. W. Thieret, KNK.
- Fimbristylis*, *Fuirena*, *Bulbostylis*, *Abildgaardia*—monographic, new world, R. Kral, VDB.
- Rhynchospora*—revision, S. M. Kooijman, FLAS.
- Scleria*—SE US, monographic, floristic, J. E. Fair-ey, III, CLEMS.
- ERICACEAE**
- Ellittia racemosa*—biosystematics and reproductive biology, D. J. Drapalik, GAS.
- Leucothoe*, *Zenobia*, *Pernettya*—monographic and phytographic, SE US and SE Asia, N. C. Melvin, III, St. Andrews Presby. College, Laurinburg, NC.
- Lyonia*, *Pieris*, *Agarista*, *Craibiodendron*—monographic, W. S. Judd, FLAS.
- Rhododendron*, lepidotes—biosystematics, SE US, W. H. Gensel, NCSC.
- Vaccinium*—species complex, biosystematics, W. H. Cribbs, VSC.
- Vaccinium macrocarpon*—phytogeography of cranberry bogs, D. W. Ogle, Va. Highlands Comm. Coll., Abingdon, VA.
- EUPHORBIACEAE**—woody Euphorbiaceae of Florida Keys, biosystematic, anatomy, W. J. Hayden, MARY.
- FABACEAE** (see Leguminosae)
- Calliandra*—chemical systematics and ecology, J. T. Romeo, USF.
- Galactia*—floristic, SE US, D. W. Hall, FLAS.
- FAGACEAE**
- Quercus* spp.—hardwood regeneration and fire, M. Teuke, CLEMS.
- Quercus oglethorpensis*—ecology, taxonomy, phytogeography, biology, G. Haehnle, CLEMS.
- Quercus rubra*—chromatographic analysis of variation, K. M. McDougal, NCU.
- Quercus rubra* var. *borealis*—descriptive ecology, J. H. Horton, WCUH.
- Quercus rubra*, *Q. velutina*, *Q. coccinea*—variability and hybridization, M. Baranski, Catawba Coll., Salisbury, NC.
- GROSSULARIACEAE**
- Grossularia*—revision, Q. P. Sinnott, MARY.
- HYDROCHARITACEAE**—family survey, chemical, histochemical, C. Dawes, USF.
- JUGLANDACEAE**
- Carya*, *Juglans*—serology, R. B. Clarkson, WVA.
- JUNCACEAE**—taxonomy of family, worldwide, but primarily SE US, J. C. Coffey, St. Mary's Coll., Raleigh, NC.
- LABIATAE**—family, taxonomic, J. L. Collins, TVA, Land and Forest Resources, Norris, TN.
- Synandra hispidula*—species biology, M. A. Burdette, MUHW.
- LEGUMINOSAE** (see Fabaceae, Caesalpiniaceae, & Papilionaceae)
- Circidae—monographic, worldwide, R. P. Wunderlin, USF.
- Pachecoa*—generic delimitation from *Chapmannia*, C. R. Gunn, E. M. Norman, Stetson, Deland, FL and J. S. Lassetter, Eastern Ky., Richmond, KY.
- Vicia*—biosystematics, new world, J. S. Lassetter, Eastern Ky., Richmond, KY.
- Vicia*—nomenclature for the genus, worldwide, J. S. Lassetter, Eastern Ky., Richmond, KY.
- LILIACEAE**
- Alettris*—biosystematic, P. L. Risk, NCU.

- Smilax*—biosystematic, US species, G. A. Wallace, CLEMS.
- MALVACEAE**
Gossypium arboreum and *G. herbaceum*—genetics of isozyme systems, K. A. Suiter, NCU.
Kosteletskyia virginica—seed selection, G. F. Somers and J. L. Gallagher, DELS.
- MELASTOMACEAE**
Miconia—monographic, W. S. Judd, FLAS.
- OLEACEAE**
Fraxinus americana—chemotaxonomic, C. Black, NCSC.
- ONAGRACEAE**
Ludwigia—population ecology, R. E. Wilcox, Savannah River Ecol. Lab., Aiken, SC.
Oenothera, *Ludwigia*, *Epilobium*, *Gaura* and *Circaea*—embryological, statistical analysis of ovule and megagametophyte development, J. M. Herr, Jr., USCH.
- ORCHIDACEAE**
Cleistes, *Platanthera*, *Spiranthes*, *Triphora*—reproductive biology and ecology of WV species, K. B. Gregg, WWV.
Spiranthinae—palynotaxonomic, systematics of new world species, P. Balogh, Germantown, MD.
- PAPILIONACEAE**—comparative embryology of SE US genera, R. George, USCH.
- PINACEAE**
Picea rubens—quantitative vegetation studies in red spruce forests of WV, J. F. Clovis, WVA.
Pinus—natural hybridization, biosystematics, R. E. Schoenike and J. D. Benson, CLEMS.
Pinus glabra—distribution, cytology and karyotype, S. Dial, PFC; R. Stalter, St. John's Univ., Jamaica, NY.
Pinus palustris—elemental cycling, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
Pinus taeda—plutonium contaminant cycling, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
- POACEAE**—floristics of species in Florida, D. W. Hall, FLAS.
Glyceria nubigena—distribution and ecology, J. L. Collins, TVA, Land and Forest Resources, Norris, TN.
Panicum—taxonomy of SE species, M. G. LeLong, U. of South Ala., Mobile, AL.
Panicum—taxonomy of Mississippi species, M. G. LeLong, U. of South Ala., Mobile, AL.
Spartina alternifolia, *S. patens*, *Distichlis spicata*, *Sporobolus virginicus*—salt tolerance, edibility, G. F. Somers and J. L. Gallagher, DELS.
- POLYGALACEAE**
Polygala—SEM taxonomy, J. R. Massey, NCU; J. W. Hardin, NCSC.
- PORTULACACEAE**
Talinum mengesii and *T. teretifolium*—population ecology, reproduction and evolution, M. E. Brown Carter, DECA.
- POTAMOGETONACEAE**—see **HYDROCHARITACEAE**
- RANUNCULACEAE**
Cimicifuga—biosystematics, monographic, G. W. Ramsey, LYN.
 Floristics of Virginia species, G. W. Ramsey, LYN.
 Genera—evolutionary relationships, G. S. Van Horn, UCHT.
Ranunculus subcordatus—distribution, species biology, D. Tolman, UNCC.
- ROSACEAE**
Aruncus dioicus—species biology, T. L. Mellichamp, UNCC.
Waldsteinia lobata—distribution and ecology, C. C. Douglass, CLEMS.
- SANTALACEAE**
Nestronia umbellula—pollination and reproduction biology, T. L. Mellichamp, UNCC.
- SAXIFRAGACEAE**
Astilbe biternata—species biology, T. L. Mellichamp, UNCC.
Heuchera—monograph, revision, H. G. Bedell, MARY.
Saxifraga careyana, *S. caroliniana*—taxonomic revision, M. R. Weber, NCSC.
- SCROPHULARIACEAE**—all genera, monographic, floristic, J. W. Thieret, KNK.
 All species—floristics of Louisiana species, K. A. Vincent, LAF.
Agalinis—taxonomic, revision, J. A. Canne, OAC.
Aureolaria—taxonomic, J. L. Collins, TVA, Land and Forest Resources, Norris, TN.
- TAXODIACEAE**—ecology of cypress swamp forests, W. A. Pepaske and H. S. Neufeld, Savannah River Ecol. Lab., Aiken, SC.
Taxodium distichum, *T. ascendens*—comparative physiological ecology, H. S. Neufeld, GA.
- THEACEAE**
Camellia japonica—genetic variation, J. F. Wendel, NCU.
Gordonia lasianthus—ecology, phenology, C. A. Gresham, Baruch Forest Science Institute, Georgetown, SC.
- TILIACEAE**—taxonomic, biosystematics of family, neotropics, W. Meijer, KY.
- TYPHACEAE**
Typha—population ecology and genetics, R. R. Sharitz, Savannah River Ecol. Lab., Aiken, SC.
- VALERIANACEAE**
Valerianella—revisional, biosystematic, D. E. Ware, WILLI.
- XYRIDACEAE**—revision of family, new world, R. Kral, VDB.

FLORA

(See also specific families)

SOUTHEAST UNITED STATES

Flora of barrens and glades of the southeast, H. R. DeSelm, TENN.

- Southeastern flora, J. R. Massey, editor, NCU. See separate list of contributors and families after the Ecology listings.
- Southern Appalachian, J. R. Massey, NCU.
- Trees of the Eastern US, W. H. and M. B. Duncan, GA.
- ALABAMA**
- Manual of vascular flora, AL-mid TN, R. Kral, VDB.
- Flora of Mobile and Baldwin Cos., M. G. LeLong, Univ. of South Ala., Mobile, AL.
- ARKANSAS**
- Grass flora of state, A. Sherif, UARK.
- Vascular flora of Carroll Co., R. Noble, UARK.
- DELAWARE**
- Arborescent vegetation, composition of hardwood forests, R. Stalter, St. John's Univ., Jamaica, NY.
- DISTRICT OF COLUMBIA**
- Revision of old DC Flora, S. G. Shetler, US.
- FLORIDA**
- Endangered species of state, K. D. Perkins, FLAS.
- Floristics and natural history of Alachua Co., W. J. Dunn, FLAS.
- Flora of Florida, D. Hall and W. Judd, FLAS.
- Vascular epiphytes of Florida, J. B. Watson, USF.
- GEORGIA**
- Checklist and atlas of vascular plants of GA, S. B. Jones and N. C. Coile, GA.
- Flora of Bulloch Co., D. J. Drapalik, GAS.
- Flora of Cumberland Plateau, S. B. Jones, GA.
- Flora of Hard Labor St. Pk., L. Hill, GA.
- Flora of Okefenokee Swamp, S. B. Jones, GA.
- Manual of the flora of GA, W. H. and M. B. Duncan and J. Kartesz, GA.
- Vascular flora of GA, an annotated checklist, W. H. Duncan and J. Kartesz, GA.
- Vegetation of Sapelo Island, W. H. Duncan, GA.
- Vascular plants of coastal plain, W. R. Faircloth, VSC.
- KENTUCKY**
- Floristics of Kentucky, J. W. Thieret, KNK.
- Floristics of Kentucky, W. Meijer, KY.
- Flora of Jackson Purchase Area, M. J. Fuller, MUR.
- Orchid flora of KY, M. J. Fuller, MUR.
- LOUISIANA**
- Aquatic and wetland seed plants, V. I. Sullivan, LAF.
- Atlas of the vascular flora, R. D. Thomas, NLU.
- Checklist of the vascular plants, and rare plants, R. D. Thomas, NLU.
- Checklist of the vascular plants of East Carroll Parish, J. McCoy, NLU.
- Checklist of the vascular plants of Franklin Parish, G. Joye, NLU.
- Checklist of the vascular plants of Ouachita Parish, R. D. Thomas, NLU.
- Checklist of the vascular plants of Sabine Parish, N. Carroll, NLU.
- Checklist of the vascular plants of St. Tammany Parish, R. D. Thomas, NLU.
- Checklist of the vascular plants of Tensas Parish, T. Briley, NLU.
- Checklist of the vascular plants of Union Parish, R. D. Thomas and L. G. Lewis, NLU.
- Checklist of the vascular plants of Washington Parish, R. D. Thomas, NLU.
- Checklist of the vascular plants of Winn Parish, K. H. Kessler, NLU.
- Flora of Louisiana, R. D. Thomas, NLU and C. M. Allen, LSU-Eunice.
- Woody plants of LA, R. D. Thomas, NLU.
- MISSISSIPPI**
- Vascular flora of MS, T. M. Pullen, MISS.
- Woody flora distribution, J. R. Watson, MISSA.
- NORTH CAROLINA**
- Floristics and vegetation studies of Rowan and adjacent counties, M. J. Baranski, Catawba Coll., Salisbury, NC.
- Vascular plant collection for the Coweeta Ecologic Reserve, J. D. Pittillo, WCUH.
- Vascular flora of Mecklenburg Co., J. F. Matthews, UNCC.
- Vascular flora of SE NC, D. J. Sieren, WNC.
- SOUTH CAROLINA**
- Flora of five barrier islands and Huntington Beach St. Pk., R. Stalter, St. John's Univ., Jamaica, NY.
- TENNESSEE**
- Vascular flora of Lauderdale Co., E. T. Browne, Memphis St. Univ., Memphis, TN.
- VIRGINIA**
- Vascular flora of the peninsula of VA, D. M. Ware, WILLI.
- Vascular flora of southern Piedmont VA, and central Blue Ridge Mts., G. W. Ramsey, LYN.
- WEST VIRGINIA**
- Aquatic flora of WV, J. F. Clovis, WVA.
- Floristics and classification of wetlands, B. Brumfield, MUHW.

ECOLOGY

(See also listings under Families and States)

GENERAL

- Patterns of natural disturbance and forest regeneration in lower montane rain forests, R. O. Lawton, Univ. of Alabama, Huntsville, AL.

EASTERN UNITED STATES

- Substrates and competition of rock outcrop communities, S. Ware, WILLI.

SOUTHEASTERN UNITED STATES

- Biomass, caloric content and productivity of aquatic vascular plants, J. W. Wooten, Univ. of So. Miss., Hattiesburg, MS.
- Species descriptions and forest management implications of endangered southeastern species, R. Kral, VDB.
- Endangered or threatened species of the TVA area.

- distribution, J. L. Collins, TVA, Land and Forest Resources, Norris, TN.
- Floristics and population ecology of beech-mixed hardwood forests, M. Treiber, US Army Eng. Topographic Labs, Ft. Belvoir, VA.
- Bio(phyto)-geoclimatology; classification of south-eastern forest vegetation, A. M. Greller, Queens Coll., Flushing, NY.
- Phytogeography of coastal wetlands, M. L. Shapiro, US Army Eng., Mobile, AL.
- Delineation by statistical methods, coastal wetlands of SE US, M. L. Shapiro, US Army Eng., Mobile, AL.
- Restoration of native prairie to highway right-of-way and cultivated fields in southern midwest, D. E. Culwell, Univ. of Cent. Ark., Conway, AR.
- Community ecology of sandpine scrub, oak-pine sandhills, G. B. Williamson, USF.
- #### GEORGIA
- Community structure, dynamics and nutrient cycling in an alluvial forest in an agricultural environment in the coastal plain, R. L. Todd, GA.
- #### KENTUCKY
- Composition of grasslands in Estill, Todd and Logan Cos., W. H. Martin, East. Ky. Univ., Richmond, KY.
- Composition of abandoned pastures in Letcher Co., A. Boebinger, East. Ky. Univ., Richmond, KY.
- Gap formation and dynamics in mixed mesophytic forests in Letcher Co., W. H. Martin and W. Romme, East. Ky. Univ., Richmond, KY.
- Litter production in mixed mesophytic forests in Letcher Co., W. H. Martin and R. Muller, East. Ky. Univ., Richmond, KY.
- Second growth forest composition of oak-hickory, oak-pine-heath, pine forests, J. Fedders, East. Ky. Univ., Richmond, KY.
- #### MARYLAND
- Seed bank studies of terrestrial communities, D. Bigwood and D. Mason, MARY.
- #### NORTH CAROLINA
- Effects of fire on *Lonicera japonica*, L. S. Barden, UNCC.
- Composition, succession, productivity and diversity of forest communities, R. K. Peet, NCU.
- Demography and life history characteristics of forest tree populations, R. K. Peet, NCU.
- Population ecology and biosystematics of rare, endangered or threatened species, R. Sutter, Dept. of Agric., Raleigh, NC.
- Invasion of *Fagus grandifolia* into a *Rhododendron catawbiense* heath bald, R. Thomas, WCUH.
- Fog, ecological importance in high summits and gaps, G. Smathers, WCUH.
- Spruce-fir origin, development and maintenance, G. Smathers, P. Saunders and G. Ramseur, WCUH.
- Community structure and dominance in mountain vegetation, G. Smathers and J. D. Pittillo, WCUH.
- Phytosociology of gnarled red oak communities along Blue Ridge Pkwy., G. Smathers and J. Horton, WCUH.
- Succession in doline pond vegetation, D. M. DuMond, WNC.
- Ontogeny of low salinity brackish marsh systems, V. Bellis, East Carolina Univ., Greenville, NC.
- Community ecology of derelict heavy metal mines, D. E. Wickland, NCU and Savannah River Ecol. Lab., Aiken, SC.
- Competitive release of forest trees following chestnut blight, R. O. Lawton, HALA.
- #### SOUTH CAROLINA
- Nutrient cycling with whole tree harvesting, D. H. Van Lear and J. Waide, CLEMS.
- Community analysis of lowland forest, R. H. Jones, CLEMS.
- Response to fire in turkey oak-longleaf sandhill communities, S. W. Workman, Savannah River Ecol. Lab., Aiken, SC.
- Trace contaminant cycling in agricultural crops, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
- Response to inundation and thermal effluents in bottomland forests, K. W. McLeod, Savannah River Ecol. Lab., Aiken, SC.
- Forest and dune ecology of lower coastal plain, C. A. Gresham, Baruch Forest Science Institute, Georgetown, SC.
- Community ecology of cypress-tupelo swamp forests, W. A. Repaske, Savannah River Ecol. Lab., Aiken, SC.
- Biology of coppice regeneration following timber harvests, R. Zahner, CLEMS.
- Successional dynamics of an old-growth bottomland hardwood forest, L. L. Gaddy, Walhalla, SC.
- #### TENNESSEE
- Effects of powerline construction and maintenance on TN glade communities, J. L. Collins, TVA, Land and Forest Resources, Norris, TN.
- Analysis of plant communities, H. R. DeSelm, TENN.
- Tree species replacement in old-growth forests, L. S. Barden, UNCC.
- Pioneer communities, seed banks; revegetation systems for disturbed sites, R. E. Farmer, TVA, Land and Forest Resources, Norris, TN.
- #### VIRGINIA
- Composition, succession, controlling factors of upland hardwood forests in the coastal plain, S. Ware, WILLI.
- Community and ecosystem ecology, nutrient recycling and decomposition in swamp forests, F. P. Day, ODU.
- Composition and succession in past-chestnut upland forests, G. Johnson and D. Blackman, WILLI.
- Phytosociology/vegetation dynamics of various Dis-mal Swamp communities, D. McElveen, ODU.

WEST VIRGINIA

Phytogeography, community and population ecology of rare plants of the middle Appalachians, R. B. Clarkson, WVA.

VASCULAR FLORA OF THE SOUTHEAST

LOWER VASCULAR PLANTS—A. M. Evans, TENN

GYMNOSPERMS—J. W. Hardin, NCSC

ACANTHACEAE—D. Wasshausen, US

ACERACEAE—W. J. Hess, MOR; G. Ware, MOR

AGAVACEAE—E. T. Browne, Jr., Memphis St. Univ., Memphis, TN

AIZOACEAE—J. R. Massey, NCU

ALISMATACEAE—R. Haynes, UNA

AMARANTHACEAE—K. R. Robertson, ILLS

ANACARDIACEAE—F. James, Presbyterian College, Clinton, SC

ANNONACEAE—R. Kral, VDB

APIACEAE—C. R. Bell, NCU; A. Lindsey, NCU

APOCYNACEAE—B. Hansen, USF

AQUIFOLIACEAE—R. Clark, MOR

ARACEAE—D. E. Boufford, GH

ARALIACEAE—P. White, Upland Field Res. Lab., Gatlinburg, TN

ARECACEAE—R. W. Read, US

ARISTOLOCHIACEAE—D. E. Boufford, GH

ASCLEPIADACEAE—C. R. Bell, NCU; J. M. Farmer, NCU

ASTERACEAE—A. Cronquist, NY

BALSAMINACEAE—J. R. Massey, NCU

BASELLACEAE—R. Long (deceased), USF

BATACEAE—W. E. Fulcher, Guilford College, Greensboro, NC

BEGONIACEAE—L. B. Smith, US

BERBERIDACEAE—A. Weakley, DUKE

BETULACEAE—J. W. Hardin, NCSC

BIGNONIACEAE—A. Gentry, MO

BIXACEAE—C. E. Nauman, FAU

BORAGINACEAE—F. Hommersand, NCU

BRASSICACEAE—R. Rollins, GH

BROMELIACEAE—L. B. Smith, US

BUDDLEJACEAE—E. Norman, Stetson Univ., De Land, FLA

BURMANNIACEAE—J. R. Massey, NCU

BURSERACEAE—D. M. Porter, VPI

BUXACEAE

CABOMBACEAE—J. H. Wiersema, UNA

CACTACEAE—J. R. Massey, NCU; J. Doyle, NCU

CAESALPINIACEAE—D. Isely, ISC

CALLITRICHACEAE—J. W. Thieret, KNK

CALYCANTHACEAE—K. A. Nicely, Western Kentucky Univ., Bowling Green, KY

CALYCERACEAE—G. Brown, TAES

CAMPANULACEAE—R. L. Wilbur, DUKE

CANELLACEAE—R. Long (deceased), USF

CANNABACEAE—L. C. Anderson, FSU

CANNACEAE—W. Burk, NCU

CAPPARACEAE

CAPRIFOLIACEAE—T. R. Dudley, NA; W. J. Hess, MOR; G. Ware, MOR

CARICACEAE—R. Long (deceased), USF

CARYOPHYLLACEAE

CASUARINACEAE—R. Long (deceased), USF

CELASTRACEAE—G. Brown, TAES

CERATOPHYLLACEAE—J. W. Thieret, KNK

CHENOPODIACEAE—H. Wilson, TAES

CHRYSOBALANACEAE—R. D. Whetstone, Jacksonville St. Univ., Jacksonville, ALA

CISTACEAE

CLETHRACEAE—E. Wood, GH

CLUSIACEAE—P. Adams, DPU

COMBRETACEAE—R. Huck, NCU

COMMELINACEAE—R. Faden, US

CONVOLVULACEAE—D. F. Austin, FAU

CORNACEAE—W. J. Hess, MOR

CRASSULACEAE—D. Soltis, UNC, Greensboro; G. Hammond-Soltis, UNC, Greensboro

CUCURBITACEAE—R. P. Wunderlin, USF

CUSCUTACEAE—D. F. Austin, FAU

CYMODACEAE—R. Haynes, UNA

CYPERACEAE—A. E. Radford, NCU

CYRILLACEAE—J. Thomas, UNA

DIAPENSIACEAE—D. E. Boufford, GH; J. R. Massey, NCU

DIOSCOREACEAE—B. Schubert, A

DIPSACACEAE—G. Brown, TAES

DROSERACEAE—L. Mellichamp, UNCC

EBENACEAE—C. E. Nauman, FAU

ELAEAGNACEAE—J. W. Thieret, KNK

ELAEOCARPACEAE—R. Long (deceased), USF

ELATINACEAE—J. W. Thieret, KNK

EMPETRACEAE—J. W. Hardin, NCSC

ERICACEAE—J. L. Luteyn, NY; W. Judd, FLAS; S. Vander Kloet, ACAD; S. Clemants, NY; G. Wallace, LASCA

ERIOCAULACEAE—R. Kral, VDB

EUPHORBIACEAE—G. L. Webster, DAV; M. Huft, MO

FABACEAE—D. Isely, ISC

FAGACEAE—W. H. Duncan, GA

FLACOURTIACEAE—R. W. Kiger, Hunt Institute, Pittsburgh, PA

FUMARIACEAE—D. E. Boufford, GH

GENTIANACEAE—J. S. Pringle, HAM

GERANIACEAE—S. B. Jones, GA

GOODENIACEAE—J. W. Thieret, KNK

GROSSULARIACEAE—G. Tucker, APCR

HAEMODORACEAE—J. R. Massey, NCU

HALORAGACEAE—S. Aiken, DAO; P. Catling, DAO

HAMAMELIDACEAE—J. W. Hardin, NCSC

HIPPOCASTANACEAE—J. W. Hardin, NCSC

HIPPOCRATEACEAE—C. E. Nauman, FAU

HYDRANGEACEAE—E. McClintock, UC

HYDROCHARITACEAE—R. Haynes, UNA

HYDROPHYLLACEAE—R. Beckman, NCSC

- ILLICIAEAE—J. W. Hardin, NCSC
 IRIDACEAE
 JUGLANDACEAE—D. E. Stone, DUKE
 JUNCACEAE—J. Coffey, St. Mary's College, Raleigh, NC
 JUNCAGINACEAE—R. Haynes, UNA
 KRAMERIAEAE—K. R. Robertson, ILLS
 LAMIACEAE—J. L. Collins, TVA, Land and Forest Resources, Norris, TN; R. Huck, NCU; P. Cantino, GH
 LARDIZABALACEAE—C. R. Bell, NCU; A. Lindsey, NCU
 LAURACEAE—E. Wofford, TENN
 LEITNERIACEAE—G. Tucker, APCR
 LEMNACEAE—L. J. Davenport, UNA
 LENTIBULARIACEAE
 LILIACEAE—R. G. Johnson, MUR; Amaryllidaceae—E. T. Browne, Jr., Memphis St. Univ., Memphis, TN
 LIMNANTHACEAE—J. W. Thieret, KNK
 LIMNOCHARITACEAE—R. Haynes, UNA
 LINACEAE—C. M. Rogers, WUD
 LOASACEAE—R. Long (deceased), USF
 LOGANIACEAE—J. R. Massey, NCU
 LORANTHACEAE
 LYTHRACEAE—S. Graham, KE
 MAGNOLIACEAE—J. W. Hardin, NCSC; F. Meyer, NA
 MALPIGHIACEAE—R. Huck, NCU
 MALVACEAE—S. McDaniel, MISSA
 MARANTACEAE—C. E. Nauman, FAU
 MAYACACEAE—J. W. Thieret, KNK
 MELASTOMACEAE—R. Kral, VDB
 MELIACEAE—F. James, Presbyterian College, Clinton, SC
 MENISPERMACEAE—T. M. Pullen, MISS
 MENYANTHACEAE—J. R. Massey, NCU
 MIMOSACEAE—D. Isely, ISC
 MOLLUGINACEAE—J. R. Massey, NCU
 MONOTROPACEAE—J. L. Luteyn, NY; G. Wallace, LASCA
 MORACEAE—P. White, Upland Field Res. Lab., Gatlinburg, TN
 MORINGACEAE
 MUSACEAE—J. Kress, DUKE
 MYRICACEAE—F. James, Presbyterian College, Clinton, SC
 MYRSINACEAE—R. Long (deceased), USF
 MYRTACEAE—R. Huck, NCU
 NAJADACEAE—R. Haynes, UNA
 NELUMBONACEAE—J. H. Wiersema, UNA
 NYCTAGINACEAE—J. Fay, Office of Endangered Species, Washington, D.C.
 NYMPHAEACEAE—J. H. Wiersema, UNA
 NYSSACEAE—F. James, Presbyterian College, Clinton, SC
 OLACACEAE—R. Huck, NCU
 OLEACEAE—J. W. Hardin, NCSC
 ONAGRACEAE—P. Raven, MO
 ORCHIDACEAE
 OROBANCHACEAE—J. W. Thieret, KNK
 OXALIDACEAE—M. Denton, WTU
 PAPAVERACEAE—W. Ernst (deceased), US; R. W. Kiger, Hunt Institute, Pittsburgh, PA
 PASSIFLORACEAE—J. MacDougal, DUKE
 PEDALIACEAE—J. W. Thieret, KNK
 PHYTOLACCACEAE—J. W. Thieret, KNK
 PIPERACEAE—D. E. Boufford, GH
 PLANTAGINACEAE—I. J. Bassett, DAO
 PLATANACEAE—J. W. Hardin, NCSC
 PLUMBAGINACEAE—J. L. Luteyn, NY
 POACEAE—J. Estes, OKL; H. DeSelm, TENN; M. G. LeLong, Univ. South Alabama, Mobile, AL; D. Brandenburg, OKL
 PODOSTEMACEAE—J. W. Thieret, KNK
 POLEMONIACEAE
 POLYGALACEAE—S. McDaniel, MISSA
 POLYGONACEAE—J. Horton, WCUH
 PONTEDERIACEAE—R. Haynes, UNA
 PORTULACACEAE—T. M. Pullen, MISS
 POTAMOGETONACEAE—E. Ogden, NYS
 PRIMULACEAE—J. R. Massey, NCU; R. D. Sutter, Dept. of Agric., Raleigh, NC
 PROTEACEAE—J. W. Thieret, KNK
 PUNICACEAE—R. Huck, NCU
 PYROLACEAE—J. L. Luteyn, NY
 RANUNCULACEAE—C. S. Keener, PAC
 RESEDACEAE
 RHAMNACEAE—N. Coile, GA
 RHIZOPHORACEAE—C. E. Nauman, FAU
 ROSACEAE—K. R. Robertson, ILLS
 RUBIACEAE—C. A. Lawson, OKL; E. E. Terrell, BARC; R. P. Wunderlin, USF
 RUPPIACEAE—R. Haynes, UNA
 RUTACEAE—J. Popenoe, FTG
 SALICACEAE—G. W. Argus, CAN; J. E. Eckenwalder, TRT
 SANTALACEAE—L. Musselman, ODU
 SAPINDACEAE—F. Meyer, NA
 SAPOTACEAE
 SARRACENIACEAE—S. McDaniel, MISSA
 SAURURACEAE—J. W. Thieret, KNK
 SAXIFRAGACEAE—S. Spongberg, A
 SCHEUCHZERIACEAE—R. Haynes, UNA
 SCHISANDRACEAE—D. E. Stone, DUKE
 SCROPHULARIACEAE—J. W. Thieret, KNK; N. Holmgren, NY
 SIMAROUBACEAE—F. James, Presbyterian College, Clinton, SC
 SMILACACEAE—R. G. Johnson, MUR
 SOLANACEAE—W. G. D'Arcy, MO; J. Sullivan, OKL
 SPARGANIACEAE
 SPHENOCLEACEAE—J. W. Thieret, KNK
 STAPHYLEACEAE—J. W. Thieret, KNK
 STEMONACEAE—R. D. Whetstone, Jacksonville St. Univ., Jacksonville, AL
 STERCULIACEAE

STYRACACEAE—W. Chester, APSC (Halesia)
 SURIANACEAE—J. W. Thieret, KNK
 SYMPLOCACEAE—J. W. Hardin, NCSC
 TAMARICACEAE—B. R. Baum, DAO
 THEACEAE—C. R. Parks, NCU
 THEOPHRASTACEAE—R. Long (deceased), USF
 THYMELAEACEAE
 TILIACEAE—J. W. Hardin, NCSC
 TRAPACEAE—J. R. Massey, NCU
 TROPAEOLACEAE—W. Burk, NCU
 TURNERACEAE—J. W. Thieret, KNK
 TYPHACEAE—S. G. Smith, Univ. of Wisconsin,
 Whitewater, WI
 ULMACEAE—K. A. Nicely, Western Kentucky
 Univ., Bowling Green, KY
 URTICACEAE—D. E. Boufford, GH
 VALERIANACEAE—D. M. E. Ware, WILLI
 VERBENACEAE—S. Barber, SHST; L. Collins,
 TVA, Land and Forest Resources, Norris, TN
 VIOLACEAE—N. H. Russell, CSU
 VITACEAE—G. Tucker, APCR
 XYRIDACEAE—R. Kral, VDB
 ZANNICHELLIACEAE—R. Haynes, UNA
 ZINGIBERACEAE—J. Kress, DUKE
 ZOSTERACEAE—R. Haynes, UNA
 ZYGOPHYLLACEAE—D. M. Porter, VPI

ASB MEMBERSHIP 1981

This roll of personal members is complete as of June 1, 1981. Please notify the Treasurer, Dr. J. C. O'Kelley, of any errors.

ABEL, GEORGE R. -CAD OF NAT SCIENCES BENEDICT ESTUARINE LAB BENEDICT MD 20612	ABEL, DAVID C. DANLS AND MOORE 1550 NORTHWEST HIGHWAY PARK RIDGE IL 60068	ABRAHAM, BARBARA J. DEPT NATURAL SCIENCE EASTERN KENTUCKY UNIV RICHMOND KY 40475
ACTON, JEAN D. DEPT OF BIOLOGY JAMES MADISON UNIV HARRISONBURG VA 22807	ADAMCHAK, LINDA A. BIOLOGY DEPT UNIV OF ALABAMA UNIVERSITY AL 35486	ADAMS, CURTIS H. UNIV OF ALA-BIOLOGY PO BOX 1247 HUNTSVILLE AL 35897
	ADAMS, WILLIAM H. BOX 102 FT 2 CATLETT VA 22019	ADKISON, DANIEL L. DEPT OF BIOLOGY TULANE UNIVERSITY NEW ORLEANS LA 70119
ADKISON, LINDA A. DEPT OF MICROBIOLOGY TULANE MED CTR 1450 TULANE AV NEW ORLEANS LA 70112	AHO, JOHN M. DEPT BIOL SCIENCES UNIV OF EXETER EXETER EX 4405 DEVON ENGLAND 00000	ALCHEDIAK, THOMAS 3609 DARTMOUTH AVE TAMPA FL 33603
ALDRICH, HENRY C. BOTANY DEPT UNIV OF FLORIDA GAINESVILLE FL 32611	ALIFF, JOHN W. 1715 N DECATUR DR, NE ATLANTA GA 30307	ALLEN, J. FRANCES 7517 23RD AVE HYATTSVILLE MD 20762
ALLEY, WEDDALL E. BIOLOGY DEPT EAST CAROLINA UNIV GREENVILLE NC 27834	AMERSON, HENRY W. BOTANY N. C. STATE UNIV RALLIGH NC 27607	ANDERSON, GILBERT E. 116 W CALHOUN, APT A SUNTER SC 29150
ANDERSON, HENRY M III Box 111 ST JOHN VI 00930	ANDERSON, LORAN C. BIOLOGY DEPT FLORIDA STATE UNIV TALLAHASSEE FL 32306	ANDERMAN, JEANNINE S. 1316 EVANS RD Aiken SC 29801
APPLEGATE, MICHAEL C. 552 FLOYD DRIVL LYNN HAVEN FL 32444	ARNOLD JR, JOHN G. ALLIED HEALTH PROF PFD ST MARKS DOMINICAN CLG NEW ORLEANS 70118	ASH, ANDREW A. BIOLOGY DEPT EAST CAROLINA UNIV GREENVILLE NC 27834
ASH, STANLEY W. Box 10 MARSHALL UNIV HUNTINGTON WV 25701	ASHEY, WILLIAM C. BOTANY DEPT SOUTHERN ILLINOIS UNIV CARBONDALE IL 62901	ASHTON, RAY E JR NC STATE MUSEUM NAT HIST PO BOX 27647 RALEIGH NC 27611
ATCHUE, JOSEPH A III DEPT OF BIOL SCIENCES OLD DOMINION UNIV ROFFER VA 23506	ATKINSON, TIMOTHY A. BOT DEPT CAROLINA BIOL SUP CO 2700 YORK ROAD DURLINGTON NC 27514	AULPACH-SMITH, CYNTHIA BIOLOGY DEPT UNIV OF SC COLUMBIA SC 29208
AUTH, DAVID L. 506-21 SW 34TH ST GAINESVILLE FL 32607	AYDELOTT, W. H. FIELD BIOL SCI ASSOC RT 2 BOX 63 FAIRBURN GA 30213	EADENHOP, KATHLEEN W. 2141 INDIAN HILLS DRIVE RT 14 KNOXVILLE TN 37919
BAILLY, DONALD W. 1750 NORMAL DR HOWLING GREEN KY 40101	BAILEY, PAUL C. P O BOX 47 BAILEYTON AL 35019	BAIRD, WILLIAM V. BIOLOGY-GILMER HALL UNIV OF VIRGINIA CHARLOTTESVILLE VA 22901
BAKER, ELIZABETH J. UPPN, BIOL DEPT ELMONT ABBEY COLLEGE ELMONT NC 28122	BAKER, G. MARVIN PO BOX 463 SWAINSBORO GA 30401	BAKER, CAIL S. 1417 BLACKHAWK TRAIL E JACKSONVILLE FL 32245
BALLAL, S. K. BIOLOGY DEPT TENNESSEE TECH COOKEVILLE TN 38501	BAMFORTH, STUART S. BIOLOGY DEPT TULANE UNIV NEW ORLEANS LA 70118	BARANSKI, MICHAEL J. BIOLOGY DEPARTMENT CATAWBA COLLEGE SALISBURY NC 28144

BARCELO, JEANNE A 1828 GAYLE DRIVE LEXINGTON KY 40505	BARCLAY, FRANK H 2623 W WALNUT ST JOHNSON CITY TN 37601	BARDEN, LAWRENCE S BIOLOGY DEPT UNC CHARLOTTE CHARLOTTE NC 28227
BARNETT, RONALD HELMONT CLO NASHVILLE TN 37203	BARTONE, JOHN C 4111 FALLOWS ROAD ANNANDALE VA 22003	BASKIN, CAROL L SCHOOL OF BIOLOGICAL SCIENCES UNIV OF KENTUCKY LEXINGTON KY 40506
BASKIN, JERRY M SCHOOL OF BIOL SCIENCES UNIV OF KENTUCKY LEXINGTON KY 40506	BAUMAN, THOMAS R BIOL DEPT UNIV OF ALA PO 1547 UNIVERSITY AL 35686	BAYLIS, JOHN R JR BIOLOGY DEPT UNIV OF WEST FLORIDA PENSACOLA FL 32504
	BEANER, MARK E P O BOX 8022 GREENVILLE NC 27834	BEATTY-DESANA, JEANNE ⁶⁷ GA RETAPADATION CTR 4770 N PEACHTREE ATLANTA GA 30339
BECK, EDWIN C 110 EDGEWOOD DR ATHENS GA 30601	BECKMEYER, ELIZABETH DEPT OF ZOOLOGY DUKE UNIVERSITY DURHAM NC 27706	BECKERDITE, FRED W ⁶⁷ BIOLOGY DEPT LSU ALEXANDRIA LA ALEXANDRIA LA 71303
BECKETT, SCOTT W PHISCOPL COLLEGE CNTR 170 E MAGNOLIA AVE MUEBURN AL 36830	BECKHAM, EUGENE C ZOO AND PHYSIOL LSU BATON ROUGE LA 70803	BECKMANN, ROBERT L JR ⁶⁸ 75 S1 2AC BOX 5166 BOTANY NCSU RALEIGH NC 27650
BECKER, JANE L PO BOX 84 SWEET BRIAR VA 24595	BECKIN, FRANCIS P BIOLOGY DEPT EAST CAROLINA UNIV GREENVILLE NC 27834	BELL, C RITCHIE ⁶⁹ 56 S1 2AC BOTANY DEPT UNIV OF NC CHAPEL HILL NC 27514
BELLIS, VINCENT J JR BIOLOGY DEPT EAST CAROLINA UNIV GREENVILLE NC 27834	BELLI, KENNETH T 3105 SHANNON DRIVE BALTIMORE MD 21213	BENEDICT, ALAN D ⁷⁰ 73 S1 2AC FL POWER LIGHT DEPT LEP-070 5250 W FLAGLER ST MIAMI FL 33174
BENEFIELD, LEON W JR 70 A CEDAR DR WATKINSVILLE GA 30677	BENFIELD, FARNEST F BERNING HALL-BIOLOGY W F 1 AND S U ELACKSBURG VA 24061	BENNER, DAVID G ⁷¹ 75 S1 2AC DEPT BIOL SCI E TENN STATE UNIV JOHNSON CITY TN 37601
BENNETT, HARRY J 4912 TULANE DRIVE BATON ROUGE LA 70808	BENNETT, THOMAS ACADEMY OF NATURAL SCI 19TH AND THE PARKWAY PHILADELPHIA PA 19103	BENSON, KIMBERLY B 5160 CAMP BRANCH ROAD BAKPOURSVILLE WV 25504
BREZZA, DANIEL J 625 N 24TH ST PHILADELPHIA PA 19130	BERG, JAMES D GRAD PROGRAM - ECOLOGY UNIV OF TENNESSEE KNOXVILLE TN 37916	BERKELEY, EDMUND BELLAIR 42 CANTERBURY RD CHARLOTTESVILLE VA 22901
BERNER, LEWIS ZOOLOGY DEPT UNIV OF FLORIDA GAINESVILLE FL 32611	BEYERS, ROBERT J BIOLOGY DEPT UNIV OF ALABAMA MOBILE AL 36688	BICKERT, JAMES H BIOLOGY DEPT AUGUSTA COLLEGE AUGUSTA GA 30904
BIDDLE, JAMES W 1365 EMORY RD ATLANTA GA 30306	BIERNBAUM, CHARLES K BIOLOGY COLLEGE OF CHARLESTON CHARLESTON SC 29401	BICKSEY, THOMAS W DAUPHIN ISLAND SEA LAB PO BOX 386 DAUPHIN ISLAND AL 36529
BISHOP, THOMAS D USL STATION BOX 41005 UNIV SW LOUISIANA LAFAYETTE LA 70504	BLACK, D ANNE 821 CAROLINA AVE NORTH AUGUSTA SC 29841	BLACK, JOE R LOUISIANA COLG-BIOLOGY COLLEGE STATION PINEVILLE LA 71360
BLANCH, CYNTHIA 1517 WYNNEWOOD RD COLUMBIA SC 29206	BLISS, DOROTHY C BOX 448 R MACON WOMANS COLG LYNCHBURG VA 24503	BLUM, KURT F BIOL DEPT MIDDLE TENN STATE UNIV MURFREESBORO TN 37130
BLUM, UDO BOTANY NC STATE UNIV RALEIGH NC 27607	BOGITSCH, BURTON J BOX 1713 STATION B VANDERBILT UNIV NASHVILLE TN 37235	BOLD, HAROLD C BOTANY DEPT UNIV OF TEXAS AUSTIN TX 78712

COLIEN, IRENE
223 9TH AVE NW
HICKORY NC 28601

COGDY, OLIVER C IV
405 EASTRIDGE DRIVE
VALRICO FL 33594

CORINC, LINDSAY K
BOTANY DEPT
UNIV OF GEORGIA
ATHENS GA 30602

COSTICK, LINDA R
ED DIR CHATTAHOOCHEE NAT CNTR
9135 WILLEC RD
POSWELL GA 30075

COURLAND J ALLEN III
65 COLLINGSWOOD CT
DOTHAN AL 36301

POWERS, FRANK D
BIOLOGY DEPT
UNIV OF WISCONSIN-STPT
STEVENS POINT WI 54401

BOYD, HAYWOOD
BOX 213
BREWTON PARKER COLLEGE
MT VERNON GA 30445

CRACK-HANES, SHEILA D
NATURAL SCIENCES
LICKERD CLG
ST PETERSBURG FL 33733

CRADSHAW, HANSEL D
FF WE ACFLS N H F
ERNEST SHUALS RD
ATHENS GA 30605

CRASWELL, ALVIN L
NC STATE MUS NAT HIST
PO BOX 27647
RALEIGH NC 27611

CREEDEN, JOHN E
BIOLOGY DEPT
DAVID LIFSCOMB COLLEGE
NASHVILLE TN 37203

CRIDGMAN, JOSEPHINE
715 KIRK RD
DECATUR GA 30030

CROCK, JACKIE EDWARDS
JEFFERSON DAVIS CLG
DRAWER N
BREWTON AL 36627

CROWN, HELEN D
SCI AND MATH DEPT
CLAYTON JR CLG
MORROW GA 30260

CROWN, LUTHER P
BIOLOGY DEPT
GEORGE MASON UNIV
FAIRFAX VA 22030

CROWN, SUSAN
BIOLOGY DEPT
GEORGIA SOUTHERN COLLEGE
STATESBORO GA 30460

EONG, LOFA
BIOLOGY DEPT
DRURY COLLEGE
SPRINGFIELD MO 65802

BOOLE, JOHN A JR
SCI AND MATH DIV BOX PC42
GA SOUTHERN CLG
STATESBORO GA 30458

FORTNER, SHIRLEY A
32 SOUTH TUCKER APT 13
MEMPHIS TN 38104

BOSTICK, PETER E
BIOLOGY
KENNESAW COLLEGE
MARIETTA GA 30061

EDWEN, SANDRA T
AGNES SCOTT COLLEGE
BOX 920
DECATUR GA 30030

EDWARDS, LYNN J
4920 COLE RD
MEMPHIS TN 38117

BOZEMAN, JOHN R
GA DEPT NAT RESOURCES
1200 GLYNN AVE
BRUNSWICK GA 31520

ERADLEY, CAROLYN F
DIV NAT SCIENCES AND MATH
MACON JUNIOR COLLEGE
MACON GA 31297

ERAGG, MARION F
701 STONE BLVD
TULLAHOMA TN 37386

ERASWELL, JOEL H
16307 SHIREOAK DRIVE
HOUSTON TX 77094

FRACEN, RUTH S
1806 E CROYDON DR
TALLAHASSEE FL 32303

FRINSON, MARK M
BIOLOGY
EAST CAROLINA UNIV
GREENVILLE NC 27834

BROWDER, MARGARET L
BIOLOGY DEPT
EMORY UNIVERSITY
ATLANTA GA 30322

BROWN, JACK S
BIOLOGY DEPT
UNIV OF NORTH ALABAMA
FLORENCE AL 35630

BROWN, REBECCA A
BIOLOGY DEPT
WESTERN KENTUCKY UNIV
POWELL GREEN KY 42101

BROWNE, EDWARD T JR
BIOLOGY DEPT
MEMPHIS STATE UNIV
MEMPHIS TN 38152

BOGNER, META J
1802 FELCREST DRIVE
GREENSBORO NC 27406

BOUM, BRIAN M
NEW YORK BOTANICAL GARDEN
BRUNX NY 10458

BOSCHUNG, HERBERT T
PO BOX 1927
UNIVERSITY AL 35486

BOUCHARD, RAYMOND W
7500 SEAVIEW AVF
WILLOWOOD CREST NJ 08260

EDWEN, SAMUEL J
DEPT POULTRY SCIENCE
UNIV OF GEORGIA
ATHENS GA 30602

BOX, ELGENE OWEN
GEOGRAPHY DEPT
UNIV OF GEORGIA
ATHENS GA 30602

BRACHMAN, RUSSEL C
139 PENDLETON RD
DANVILLE VA 24541

BRADLEY, TED R
BIOLOGY DEPT
GEORGE MASON UNIV
FAIRFAX VA 22030

BRANSTETTER, STEVEN G
DAUPHIN ISLAND SEA LAB
PO 386
DAUPHIN ISLAND AL 36528

BRUN, JANET KAY
BIOLOGY DEPT
UNIV OF OKLAHOMA
NORMAN OK 73019

BREIL, DAVID A
NAT SCIENCE DEPT
LONGWOOD CLG
FARMVILLE VA 23901

BRISBIN, I LEHR JR
ECOLOGICAL LAB
P O DRAWER E
AIXEN SC 29801

BROWN, DAVID P
THE ANAEROBE LABORATORY
V P 1 AND S U
ELACKSBURG VA 24061

BROWN, LESLEE DODD
501 GREEN STREET
STARKVILLE MS 39759

BROWN, RICHARD D
BIOLOGY DEPT
UNL CHARLOTTE
CHARLOTTE NC 28223

BRUCE, JAMES G
BOTANY DEPT
UNIV OF GA
ATHENS GA 30602

RYANT, CHARLEY C III
301 RHODES CLEMSON UNIV
CLEMSON SC 29631

RYDEN, ROBERT R
BIOLOGY DEPT
WILFORD COLLEGE
GREENSBORO NC 27410

BULL, ALICE L
BOX 673
HOLLINS COLLEGE
HOLLINS VA 24020

BURBANCK, WILLIAM D
BOX 15134
ATLANTA GA 30333

BURNLEY, ROBERT W
5312 PETERS CREEK ROAD
PO BOX 7017
ROANOKE VA 24019

BUSING, RICHARD T
BOTANY DEPT
UNIV OF TENNESSEE
KNOXVILLE TN 37916

CALDWELL, DAVID A
MARINELAND RES LAB
RT 1 BOX 122
ST AUGUSTINE FL 32084

CALLAHAN, JAMES T
4843 ALLENBY ROAD
FAIRFAX VA 22032

CAMERON, RANDALL G
BOTANY DEPT
UNIV OF GEORGIA
ATHENS GA 30602

CAMPER, NYAL D
PLANT PATH AND PHYSIOL
CLEMSON UNIV
CLEMSON SC 29631

CARLSON, CLAIRE L
514-G GEORGETOWN RD
CHARLOTTESVILLE VA 22901

CARPENTER, JOHN M
MORGAN SCH BIOL SCI
UNIV OF KENTUCKY
LEXINGTON KY 40506

CARTER, JOSEPH H III
P O BOX 891
SOUTHERN PINES NC 28387

CATHEY, DANIEL D
P O BOX 185
DRAEL NC 28619

CENTER, FRANCES F
P O BOX 3191
COLLEGE STATION TX 77841

CHANDLER, CLAY M
BIOL DEPT BOX 121
MIDDLE TENN STATE UNIV
MURFREESBORO TN 37130

BRYANT, RICHARD T
5655 S MARION
TULSA OK 74135

EUCKNER, RICHARD L
DIV NAT SCI MATH
LIVINGSTON UNIV
LIVINGSTON AL 35470

BULOW, FRANK J
BIOLOGY DEPT
TENN TECH UNIV
COOKEVILLE TN 38501

BURK, JOHN CARL
CLARK SCI CENTER
SMITH COLLEGE
NORTHAMPTON MA 01060

EURTON, DENNIS T
THE JOHNS HOPKINS UNIV
APPL PHYS LAB 4800 ATWELL RD
SHAUNSIDY MD 20867

EUTLER, CARY L
BIOLOGY DEPT
BOX 1927
UNIVERSITY AL 35496

CALIE, PATRICK J
6019 MAGAZINE RD
KNOXVILLE TN 37920

CAMBURN, KEITH E
KY NAT PRESERVES COMMISSION
FRANKFORT KY 40601

CAMPELL, JULIAN J N
SCHOOL OF BIOL SCIENCES
UNIV OF KENTUCKY
LEXINGTON KY 40506

CANTRELL, BUDDY
DEPT OF BIOLOGY
UNIV OF NOTRE DAME
NOTRE DAME IN 46556

CARLSON, J GORDON
ZOOLOGY DEPT
UNIV OF TENN
KNOXVILLE TN 37916

CARPENTER, LARRY D
ROUTE 2 BOX 45-A
WATERTOWN TN 37184

CARTER, M ELOISE B
DEPT BIOLOGY
AGNES SCOTT COLLEGE
DECATUR GA 30030

CAVIN, DONALD F
130 BENT CREEK DRIVE
BRANDON MS 39042

CHADWICK, C S
APT 5-1 GREEN HILLS TR
1900 RICHARD JONES RD
NASHVILLE TN 37215

CHAPMAN, JOE A
210 W ELLIS ST
JEFFERSON CITY TN 37760

BRYANT, WILLIAM S
BIOLOGY DEPT
THOMAS MOORE COLLEGE BOX 85
FT MITCHELL KY 41017

BUIKEMA, ARTHUR L JR
BIOLOGY DEPT
V P I AND S U
BLACKSBURG VA 24061

BURBANCK, MADELINE
P O BOX 15134
ATLANTA GA 30333

BURNHAM, KENNETH D
ZOOLOGY DEPT
UNIV OF TENNESSEE
KNOXVILLE TN 37916

BUSHEY, CHARLES L JR
BOTANY DEPT
SOUTHERN ILLINOIS UNIV
CARBONDALE IL 62901

CAIRNS, JOHN JR
PRFC OF BIOLOGY
V P I AND S U
BLACKSBURG VA 24061

CALKINS, JOHN
DEPT OF RADIATION MEDICINE
UNIVERSITY OF KENTUCKY
LEXINGTON KY 40536

CAMERON, JANE T
7741 DONNYBROOK CT #102
ANNANDALE VA 22003

CAMPBELL, P SAMUEL
UNIV OF ALA BIOLOGY
P O BOX 1247
HUNTSVILLE AL 35807

CAPONETTI, JAMES D
BOTANY DEPT
UNIVERSITY OF TENN
KNOXVILLE TN 37916

CARPENTER, I W
BIOLOGY DEPT
APPALACHIAN STATE UNIV
BOONE NC 28608

CARTER, DOUGLAS R
7-D UNIVERSITY APTS
CLEMSON SC 29631

CASHNER, ROBERT C
BIOLOGICAL SCIENCES
UNIV OF NEW ORLEANS
NEW ORLEANS LA 70122

CAVIN, JOY D
130 BENT CREEK DRIVE
BRANDON MS 39042

CHAMBERLAIN, NORMAN A
MARINE LABORATORY
RT 1
CHARLESTON SC 29412

CHAPMAN, RUSSELL L
BOTANY DEPT
LSU
BATON ROUGE LA 70803

CHATFIELD JONATHAN M 2934 MERRILL AVE HUNTINGTON WV 25702	CHESTER, EDWARD W BIOLOGY DEPT AUSTIN PEAY ST UNIV CLARKSVILLE TN 37040	CHIPLEY, ROBERT R THE NATURE CONSERVANCY 1800 N KENT ST ARLINGTON VA 22209
CHRISTENBERRY, GEO A FRES-AUGUSTA COLLEGE 2500 WALTON WAY AUGUSTA GA 30904	CHRISTIANSON TIM A SREL DRAWER E AIREN SC 29801	CHURCHILL, HELEN 515 STRAND ROAD NE ROANOKE VA 24012
CLAMP, JOHN C NC STATE MUS NAT HIST PO BOX 27647 RALEIGH NC 7611	CLARK, DARRYL R 118 ST JAMES LAFAYETTE LA 70506	CLARK, JAMES R BIOLOGY DEPT VP1 AND SU BLACKSBURG VA 24061
CLARK, JIMMY D BIOLOGY UNIV OF KENTUCKY LEXINGTON KY 40506	CLARK, ROSS C THE YORTON ARBORETUM LISLE IL 60532	CLAPKE, DOUGLAS G 1835 ERNEST DR MOBILE AL 36609
CLARKSON ROY B BIOLOGY DEPT WEST VA UNIV MORGANTOWN WV 26503	CLEBSCH, EDWARD E C GRAD PROF IN ECOL UNIV OF TENN KNOXVILLE TN 37916	CLEMENTS LINDA C AMEX FIVERS ISLAND FERNFORD NC 28516
CLEMMER, GLENN H 1700 BLUE SPRUCE DRIVE USFWS FORT COLLINS CO 80524	COFFEY, JANICE C ST MARYS JUNIOR COLLEGE RALEIGH NC 27611	COHEN, JERRY A MD 4430 NW 13TH AVE GAINESVILLE FL 72605
COLL JN ASHTON L BIOLOGY DEPT UNIV OF TENNESSEE KNOXVILLE TN 77916	COLLIER ALBERT W 143 N CALLE DEL DIAELO #1703 GREEN VALLEY AZ 85614	COLLINS, BEVERLY S BOTANY 713 SCIENCE HALL WASHINGTON STATE UNIVERSITY PULLMAN WA 99164
COLLINS, RICHARD F U O M S - MICROBIOLOGY 3200 CHAND AVE DES MOINES IA 50312	COLOSI, JOSEPH C 342 KENMORE PL LONDON ONTARIO CANADA N5Y 1V2 00000	COMBS, CHRISTOPHER L P O DRAWER FM COLLEGE STATION TX 77840
COPELAND, BERRY LYNN P O BOX 5447 RALEIGH NC 27650	CORER, ALAN E BIOLOGY DEPT UNC ASHEVILLE ASHEVILLE NC 28814	COMPTON, DAVID A 6014 WINDSOR DR #C MECHANICSVILLE VA 23111
CONNELL, CLYDE E BIOLOGY DEPT VALDESTA ST CLG VALDESTA GA 71611	CONNER, GEORGE BIOLOGY LOYOLA COLLEGE BALTIMORE MD 21210	CONNER, JOHN V FORESTRY AND WILDLIFE LSU BATON ROUGE LA 70803
CONSTANTIN MILTON J 4705 SILVERHILL DR KNOXVILLE TN 77921	CONTOS, NICHOLAS 322 LIPONA RD TALLAHASSEE FL 32304	COLE, DAVID G DEPT ZOOL 223 PARTMAN HALL UNIV OF FLORIDA GAINESVILLE FL 72611
COOLEY, JAMES R DEPT NATURAL SCIENCE LIBERTY B ARTIST COLLEGE LYNCHBURG VA 24506	COOLEY, JUNE H 179 WILLEDGE TERRACE ATHENS GA 30606	COOLEY, NELSON P ENV PROT AGENCY GULF BREEZE LAB GULF BREEZE FL 72561
COOPER, ARTHUR W 719 RUNNYMEDE RD RALEIGH NC 27607	COOPER, CHARLES M LSDA ARS BOX 1157 OXFORD MS 38655	COOPER, JOHN EDWARD N C STATE MUS NAT HIST P O BOX 27647 RALEIGH NC 27611
COOPER, MARTHA R N C STATE MUS NAT HIST PO BOX 27647 RALEIGH NC 27611	COPLAND THOMAS P BIOLOGY DEPT EAST TENN ST UNIV JOHNSON CITY TN 37601	CORNF, EARL L BIOLOGY DEPT W VA UNIV MORGANTOWN WV 26505
CORNFAN, JULIE L DEPT OF BIOLOGY EMORY UNIV ATLANTA GA 30322	CORNUM, KENNETH C ZOOLOGY AND PHYSIOLOGY LA STATE UNIV BATON ROUGE LA 70803	COSKREN, FAITH H 849 LYNN DR LEXINGTON KY 40504
COTTER, DAVID J BIOLOGY CHMN GEORGIA COLLEGE MILLEDGEVILLE GA 71061	COUCH, JOHN V BOTANY DEPT UNC-CH CHAPEL HILL NC 27514	COWDEN, RONALD F ASSOC DEAN BASIC SCIENCE ETSU-COLLEGE OF MEDIC JOHNSON CITY TN 37601

COLE, ROBERT J RT 3 BOX 434 JONESBORO TN 37659	COX, PRENTISS G BIOLOGICAL SCIENCES MISSISSIPPI COL CLINTON MS 39056	
CRAWFILL, RAYMOND L DIV BIOL SCIENCES UNIV OF MICHIGAN ANN ARBOR MI 48109	CRAVEN, THOMAS M RT 1 BOX 66 WATERLOO AL 35677	CRAWFORD, EDWARD A JR BIOLOGY DEPT HAMPTON SYDNEY COL HAMPTON SYDNEY VA 23943
CRAWFORD, EDWARD A JR BIOLOGY DEPT HAMPTON SYDNEY COL HAMPTON SYDNEY VA 23943	CROPPER, WENDELL P JR BIOLOGY DEPT EMORY UNIV ATLANTA GA 30322	CRESHA, LYNN M BIOLOGY DEPT FRANCIS MARION COL FLORENCE SC 29501
CRAWLEY, PHILLIP H BIOLOGY UNIV OF KENTUCKY LEXINGTON KY 40506	CROY, STEVEN L RT 2 BOX 289 CHRISTIANBURG VA 24073	CRUM, W EOWMAN JR 2127 PANDLA WAY CT LITHONIA GA 30058
CRITCHFIELD, PHILLIP 901 MONTCLAIR RD FAYETTEVILLE NC 28304	CUNNINGHAM, ANN 276 WOODLAND HILLS TUSCALOOSA AL 35405	CUNNINGHAM PHILLIP R 1400 POPLAR ST MURRAY KY 42071
CUPP, PAUL V JR BIOL DEPT EASTERN KY UNIV RICHMOND KY 40475	CURRY, MARY-GRACE 42 BEAUREGARD DR GRETNAL LA 70053	CUSIC, ANNE M 360 CHAUMONT DR BIRMINGHAM AL 35223
DAGGY, TOM DAVIDSON COL BOX 676 DAVIDSON NC 28036	DANIEL, CHARLES P P O BOX 673 GEORGIA COL MILLEDGEVILLE GA 31061	DANIEL, ROBERT E BIOLOGY DEPT MURRAY STATE UNIV MURRAY KY 42071
DARDEAU, MICHAEL R PO BOX 386 DAUPHIN ISLAND AL 36528	DARLINGTON, JULIAN T BIOLOGY-N PARKWAY SW AT MEMPHIS MEMPHIS TN 38112	DAUGHERTY, PATRICIA A BIOLOGY DEPT E CAROLINA UNIV GREENVILLE NC 27634
DAVENPORT, LAWRENCE J BIOLOGY P O BOX 1927 UNIVERSITY AL 35486	DAVENPORT, LESLIE D 726 WINDSOR RD SAVANNAH GA 31406	DAVIS, BILL J DEPT OF ZOOLOGY LA TECH RUSTON LA 71270
DAVIS, GRAHAM J BIOLOGY DEPT E CAROLINA UNIV GREENVILLE NC 27834	DAVIS, JENNIFER J BOX 481 SHORTER COLLEGE ROME GA 30161	DAVIS, JOHN E JR BIOLOGY DEPT MADISON COL HARRISONBURG VA 22801
DAVIS, KENNETH B JR BIOLOGY DEPT MSU MEMPHIS TN 38152	DAWLEY, CHARLOTTE W BIOLOGY DEPT UNC-G GREENSBORO NC 27412	DAWSON, STEVEN C 11 COUNTRY LAKE APT 111 MOBILE AL 36608
DAY, FRANK P 1312 MILTON STREET NORFOLK VA 23505	DAY, JOHN W JR MARINE SCIENCES DEPT LSU BATON ROUGE LA 70803	DE LA CRUZ, ARMANDO BIOLOGY P O DRAWER 67 MISS STATE UNIV MISS STATE MS 39762
DEASON, TEMD R P O BOX 1927 UNIV OF ALA UNIVERSITY AL 35486	DECK, JAMES E BIOL SCIENCES DEPT UNIV OF TENN AT MARTIN MARTIN TN 38238	DECKER, R DEAN BIOLOGY DEPT UNIV OF RICHMOND RICHMOND VA 23177
DELCOURT, HAZEL R ENVIRON SCI DIVISION ORNL BOX X BLDG 1505 OAK RIDGE TN 37830	DELCOURT, PAUL A DEPT GEOL SCIENCES UNIV OF TENNESSEE KNOXVILLE TN 37916	DEL PORTILLO, H JR BIOLOGY DEPT WAKE FOREST UNIV WINSTON-SALEM NC 27109
DENNIS, MICHAEL TVA FDB MUSCLE SHOALS AL 35660	DENT, JAMES BIOL DEPT GILMER HALL UNIV OF VA CHARLOTTESVILLE VA 22903	DEPOE, CHARLES E BIOLOGY DEPT NORTHEAST LA STATE UNIV MONROE LA 71209
DESELY, HENRY R BOTANY DEPT UNIV OF TENNESSEE KNOXVILLE TN 37916	DEWAR, JAMES B JR SCIENCE DEPT CHOWAN COL MURFREESBORO NC 27855	DEYOUNG, HARRY F 420 SANTEETLAH MARYVILLE TN 37801

DIAL, STEVE C PO BOX MISENHEIMER NC 26109	DICKEY, MARY ANN BOTANY LSU BATON ROUGE LA 70803	DICKINSON, JOSHUA C FL STATE MUSEUM UNIV OF FLORIDA GAINESVILLE FL 32611
DICKSON, GARY W 6504 KENNEDY DR PETHESDA MD 20034	DILLAND, GARY E BIOLOGY DEPT WESTERN KY UNIV BOWLING GREEN KY 42101	DIMATTEO, ANTHONY DEPT MARINE SCI-UNIV SO FL 601-1ST STREET SOUTH ST PETERSBURG FL 33701
DIMICK, JOHN F WAKE FOREST UNIV 2860 WESLEYAN LAKE WINSTON-SALEM NC 27106	DIMOCK, RONALD V JR BIOLOGY DEPT WAKE FOREST UNIV WINSTON-SALEM NC 27109	DINDO, JOHN DAUPHIN ISLAND SEA LAB P O BOX 380 DAUPHIN ISLAND AL 36528
DIXON, CARL F 200L PND ENTOMOL DEPT AUBURN UNIV AUBURN AL 36830	DODD, C KENNETH JR DES USFWS WASHINGTON DC 20240	DOOLITTLE, WILLIAM L 18 ELLIS AVE HANOVER MA 02339
DOTSON, ELLEN L B 8568 GEORGIA SOUTHERN CLG STATESBORO GA 30460	DOUELES, JAMES A ENVIRON AND NAT SCI NORTHERN VA COMM CLG WOODBRIDGE VA 22191	DOUGLAS, CAROLINE C BOTANY DEPT CLEMSON UNIV CLEMSON SC 29631
DOYLE, LAURA M 365 HAWTHORNE AVE PALO ALTO CA 94301	DRAPALIN, DONALD J BIOLOGY DEPT BOX 8042 GA SOUTHERN CLG STATESBORO GA 30458	DUBAY, DENIS T BIOLOGY DEPT EMORY UNIV ATLANTA GA 30322
DUBAY, ROBERT C RT 1 BOX 245C AMISSVILLE VA 22002	DUKE, STEPHEN O SOUTHERN WOOD SCIENCE LAB P O BOX 725 STONEVILLE MS 38776	DUMOND, DAVID M 225 CHEYENNE TRAIL WILMINGTON NC 28401
DUNCAN, P BRUCE 908 SHEPARD ST MOREHEAD CITY NC 28557	DUNLAP, WILLIAM H BOTANY DEPT UNIV OF GA ATHENS GA 30602	DUNDEE, DOLORES S BIOLOGY DEPT UNIV OF NEW ORLEANS NEW ORLEANS LA 70122
DUNN, B ALLEN FORESTRY DEPT CLEMSON UNIV CLEMSON SC 29631	DUNN, MARY C BOX 344 MIDDLE TENN STATE UNIV MURFREESBORO TN 37132	DUPONIS GRAY EILEEN 1855 BRIGHTSIDE DRIVE APT 203 BATON ROUGE LA 70808
DUPONIS GRAY, EILEEN F 1855 BRIGHTSIDE DRIVE APT 203 BATON ROUGE LA 70808	DUPONT, JAREN T BIOLOGY DEPT UNIV SOUTHWESTERN LA LAFAYETTE LA 70504	DUFRE, RANDALL K SCHOOL OF BIOLOGY UNIV OF KENTUCKY LEXINGTON KY 40506
DYCK, LAURENCE A BOTANY DEPT CLEMSON UNIV CLEMSON SC 29631	DYCKUS, DONALD L 1622 CULLMAN ST FLORENCE AL 35630	DYER, KEITH W BOTANY DEPT UNIV OF TENNESSEE KNOXVILLE TN 37916
EDMISTEN, JOE ALLEN ECOLOGICAL CONSULTANTS 2714 10TH AVENUE PENSACOLA FL 32501	EDWARDS, MAURICE E BIOLOGY DEPT U OF TENN AT CHAT CHAFFANOOGA TN 37401	EGAR, MARGARET WELLS 2969 SOMERTON ROAD CLEVELAND HTS OH 44113
ELIUTRIUS, LIONEL N GULF COAST RES LAB EAST BEACH DR OCEAN SPRINGS MS 39564	ELLIOTT, LARRY P BIOLOGY DEPT WESTERN KY UNIV BOWLING GREEN KY 42101	ELLIOTT, LEE F BOTANY DEPT SOUTHERN IL UNIV CARBONDALE IL 62901
ELLIS, JANET L 379 GERRING ST 220 ATHENS GA 30605	ELLIS, WILLIAM H BIOLOGY DEPT AUSTIN PEAY ST UNIV CLARKSVILLE TN 37040	ELMORE, JAMES L OAK RIDGE NATL LABORATORY ENVIRON SCIENCE DIVISION OAK RIDGE TN 37830
ELY, THOMAS H BIOLOGY DEPT CAPITAL UNIV COLUMBUS OH 43209	ENTREKIN, DEBORAH L BIOL DEPT LANDRUM BOX 8042 STATESBORO GA 30460	ERVIN, M G PO DRAWER 6Y MISSISSIPPI STATE MS 39762
ESCH, GERALD W BIOLOGY DEPT WAKE FOREST UNIV WINSTON-SALEM NC 27109	ESHAM, LOIS P UPO 861 MSU MOREHEAD STATE UNIV MOREHEAD KY 40351	ESTES, EDNA E 1177 S DIVISION ST SALISBURY MD 21801

TNIER, DAVID A ZOLOGY AND ENTOMOLOGY UNIV OF TENN KNOXVILLE TN 37916	EURANKS MICHAEL J 5512 HIGHLAND RD MOBILE AL 36609	EVANS, A MURRAY BOTANY DEPT UNIV OF TENN KNOXVILLE TN 37916
EVANS DAN A IOLOGY DEPT MARSHALL UNIV HUNTINGTON WV 25701	EVANS, MARC BOTANY SOUTHERN ILLINOIS UNIV CARBONDALE IL 62901	EVERITT, BETTY ZOOLOGY DEPT LSU BATON ROUGE LA 70803
EZELL, A BRUCE DEPT OF BIOLOGY GEORGIA SOU CLG STATESBORO GA 30460	FAIRCLOTH, WAYNE R BIOLOGY DEPT VALDOSTA STATE CLG VALDOSTA GA 31601	FAIRLEY, JOHN E III BOTANY DEPT CLEMSON UNIV CLEMSON SC 29631
FANVALY MARION T CNTR FOR WETLAND RESOURCES LSU BATON ROUGE LA 70803	FANTZ, PAUL R DEPT AGRIC SCI-130 KILGORE SCHOOL AGRIC LIFE SCI NCSU RALEIGH NC 27650	FARMER, JANIS M BOTANY DEPT COKER HALL OICA UNC CHAPEL HILL NC 27514
FARMER, PAUL K 4515 SHANNESS RD MARTINEZ GA 30907	FEEMAN, JOE C JR TVA FISHERIES NORRIS TN 37826	FEHON, JACK H BIOLOGY DEPT QUEENS CLG CHARLOTTE NC 26274
FELDER, DARRYL L IOL DEPT UNIV SW LOUISIANA LAFAYETTE LA 70504	FELDKAMP, SUSAN M BOTANY DEPT UNIV OF TENNESSEE KNOXVILLE TN 37916	FERGUSON, LYNN M DEPT NATURAL SCIENCE LONGWOOD CLG FARMVILLE VA 23901
FERRIEL, ELAINE R IOL DEPT WESTERN KY UNIV DOWLING GREEN KY 42101	FINCHER, JOHN A 315 GRAN AVE BIRMINGHAM AL 35209	FINDLEY ANNA MARIE ZOOLOGY AND PHYSIOLOGY LSU BATON ROUGE LA 70893
FINLAY, MARY F IOLOGY DEPT BENEDICT COLLEGE COLUMBIA SC 29204	FITZGERALD, MALINDA E 566 WESCOTT S MEMPHIS TN 38111	FITZMAYER, KAREN M U S FISH AND WILDLIFE SERVICE SE FISH CULT LAB RT 3 BOX 56 MAKION AL 36756
FITZSIMONS, JOHN M MUSEUM OF ZOOLOGY LSU BATON ROUGE LA 70803	FLAGG, RAYMOND U 712 J DAVIS ST BURLINGTON NC 27215	FLEISZAR, KATHLEEN A NATURAL SCIENCE AND MATH KENNESAW COLLEGE MARIETTA GA 30061
FLEMING, DIANE O 2313 F WHIPP RD KETTERING OH 45440	FLICKINGER, SR GRACE M BIOLOGY DEPT XAVIER UNIV NEW ORLEANS LA 70125	FLINT, ELIZABETH P BOTANY DEPT DUKE UNIV DURHAM NC 27706
FLINT, FRANKLIN F IOLOGY DEPT A MACON WOMANS CLL LYNCHBURG VA 24503	FLORY, WALTER S BOX 7325 REYNOLDA STATION WINSTON-SALEM NC 27109	FLOYD, J CHARLES 30 VERA CIRCLE COLUMBIA SC 29204
FOOTE, KAREN J 2133 TERRACE AVE BATON ROUGE LA 70806	FORD, FLOYD M BIOLOGY DEPT AUSTIN PEAY ST UNIV CLARKSVILLE TN 37040	FOREMAN, CHARLES W UNIV OF THE SOUTH SEWANEE TN 37375
FORKS, THOMAS P IOLOGY DEPT UNIV SOUTHERN MISSISSIPPI HATTIESBURG MS 39401	FORTMAN, JON R BOX 100 ROW COLUMBUS MS 39701	FOSTER, MARGARET W RUFFNER MTN NATURE CENTER 1214 81ST ST SOUTH BIRMINGHAM AL 35206
FOX, THOMAS H IOLOGY NORTH GEORGIA CLG DAHLONEGA GA 30533	FRALISH, JAMES S FORESTRY DEPT SOU ILL UNIV CARBONDALE IL 62901	FRAME, DANIEL S WEST VIRGINIA WFSLEYAN CLG BOX 802 BUCKHANNON WV 26201
FRANCIS PATRICK C 10109 HURTON GLEN DR ROCKVILLE MD 20850	FRANKL, ROBERT G BIOLOGY DEPT UNIV OF TENN CHATTANOOGA TN 37401	FRANKLIN, BERYL C BIOLOGY DEPT NE LOUISIANA UNIV MONROE LA 71209
FRANZ, RICHARD DEPT NATURAL SCIENCE FLORIDA ST MUSEUM GAINESVILLE FL 32611	FREDERICK, LAFAYETTE BOTANY HOWARD UNIV WASHINGTON DC 20059	FREEMAN JOHN A BIOLOGY DEPT BOX 5097 WINTHROP CLG ROCK HILL SC 29730

FREEMAN, JOHN ALAN
DEPT OF BIOLOGICAL SCIENCES
UNIV OF SOUTH ALABAMA
MOBILE AL 36688

FRENCH, ELIZABETH
3100 OCOFE TRAIL
KNOXVILLE TN 37917

FURRY, JOHN C
GEN DELIVERY
FALLING ROCK WV 25079

GARDNER, FRANCIS E JR
BIOLOGY DEPT
COLUMBUS COLLEGE
COLUMBUS GA 31907

GARTEN, CHARLES T JR
205 TUSCULUM DR
OAK RIDGE TN 37830

GEIGER, JAMES G
S E FISH CULTURE LAB USFWS
ROUTE 3 BOX 56
MARION AL 36756

GIBSON, ROBERT A
HARBOR BRANCH FOUND
RD 1 BOX 196
FORT PIERCE FL 33450

GILLIGAN, MATTHEW R
P O BOX 2325
SAVANNAH GA 31904

GIST, GINGER LEE
1715 HIGHLAND AVE
KNOXVILLE TN 37916

GOLDEN, MICHAEL S
FORESTRY DEPT
AUBURN UNIV
AUBURN AL 36830

GOODSON, ELIZABETH C
IN ENVIRON SCI SAVANNAH RIVER
U S DEPT OF ENERGY
AIKEN SC 29801

GORDON, ROBERT E
GFC ADVANCED STUDIES
UNIV OF NOTRE DAME
NOTRE DAME IN 46556

GOUDIE, CHERYL A
DEPT FISH AND ALLIED AQUACUL
AUBURN UNIV
AUBURN AL 36830

GRAHAM, RICHARD D JR
ROUTE 1
COLLEGE GROVE TN 37046

GRAVES, WILLIAM L
FACULTY ESTUARINE RES LAB
BENEDICT MO 30612

GREENE III, JOHN H
277 SECOND STREET
CHICKASAW AL 36611

FREEMAN, JOHN D
BOTANY PL PATH MICRO DEPT
AUBURN UNIV
AUBURN AL 36830

FRIAUF, JAMES J
5010 ASKEY
ROUTE A
PRENTWOOD TN 37027

GALLAGHER, SUSAN B
12250 6TH ST EAST
TREASURE ISLAND FL 33706

GARNER, FRANCES M
BOX 1011
WILMINGTON NC 28402

GATES, J EDWARD
APPALACHIAN ENVIRON LAB
UNIV MD FROSTBURG ST CLG
FROSTBURG MD 21532

GENTRY, JOHN B
SREL
DRAWER E
AIKEN SC 29301

GILBERT, MARGARET L
BIOLOGY DEPT
FL SOUTHERN CLG
LAKELAND FL 33802

GILMAN, LAUREN L
U MIAMI BIOLOGY
PO BOX 249118
CORAL GABLES FL 33124

GODFREY, ROBERT K
DEPT BIOL SCIENCES
FLORIDA STATE UNIV
TALLAHASSEE FL 32306

GOMEZ, MARTA M
DEPT OF BIOLOGICAL SCIENCES
OLD DOMINION UNIV
NORFOLK VA 23506

GOODYAR, NANCY L
DIV SCIENCE AND MATH
FAIRBRIDGE JR COLLEGE
FAIRBRIDGE GA 31717

GOSS, JAMES JO
5235
AUSTIN FFAY STATE UNIV
CLARKSVILLE TN 37046

GRADY, JAMES M
ZOOLOGY DEPT
SOUTHERN ILLINOIS UNIV
CARBONDALE IL 62901

GRAHAM, TOM M
BIOL DEPT
PO BOX 1927
UNIVERSITY AL 35486

GRAY, IRVING E
ZOOLOGY DEPT
DUKE UNIV
DURHAM NC 27706

GREENE-MCLEOD, JUDITH
SREL
DRAWER E
AIKEN SC 29801

FREER, RUSKIN S
1158 TIMBER LAKE DR
LYNCHBURG VA 24502

FULLER, DOROTHY L
PO BOX 418
DELAND FL 32720

GALLE, FRED C
CALLAWAY GARDENS
FINE MIN GA 31822

GARRETT, ROBERT A
LAW ENGINEER TEST CO
2749 DELK RD SE
MARITTA GA 30067

GAULDEN, MARY E
U OF TX SW MED SCH RAD
5323 HARRY HINES BLVD
DALLAS TX 75235

GIBBONS, J WHITFIELD
SREL
DRAWER E
AIKEN SC 29801

GILBERT, RUNNIE J
FOREST RESOURCES
UNIV OF GEORGIA
ATHENS GA 30602

GIPSON, JOHN F
INDIAN SPRINGS SCHOOL
RT 1 BOX 473
HELENA AL 35080

GOETZ, STEPHEN G
U-BOX 6252
FLORIDA ST UNIV
TALLAHASSEE FL 32317

GONSOLVIN, GENE
ENVIRON AFFAIRS TECH SERVICES
SOUTHERN NATURAL GAS CO
BIRMINGHAM AL 35202

GOULSPY, KATHY M
5830 SHAMROCK RD
DURHAM NC 27713

GOTTSCHALK, MARLIN R
BOX 21532
EMORY UNIV
ATLANTA GA 30322

GRAHAM, DOUGLAS A
SCIENCE DEPT
ATLANTIC CHRISTIAN CLG
WILSON NC 27893

GRAVES, JAMES H
DEPT MATH/SCIENCE
HAWASSEE COLLEGE
MADISONVILLE TN 37354

GRELEY, MARK S
BIOLOGY DEPT
UNIV ALA BIRMINGHAM
BIRMINGHAM AL 35294

GREGG, KATHERINE R
BIOLOGY
W VA WESLEYAN CLG
BUCKHANNON WV 26201

RELLER, ANDREW H
DEPT OF BOTANY
UNIV OF PERadeniya, PERadeniya
SRI LANKA 00000

CRINDSTAFF, GREGG S
BIOLOGY DEPT
EASTERN CAROLINA UNIV
WELLSVILLE NC 26723

CROSS, LOUIS J
MATHEMATICS DEPT
UNIVERSITY OF TENNESSEE
KNOXVILLE TN 37916

CUTNATH, ELIZABETH L
202 PROGRESS ST, B
BLACKSBURG VA 24060

FAHNLE, GARY G
FORESTRY, F AND W R BLDG
CLEMSON UNIV
CLEMSON SC 29632

FAINLS, ANDREW G
1502 FORREST AVE #1
KNOXVILLE TN 37916

FALL, DAVID W
179 ROLES HALL
UNIV FLORIDA
GAINESVILLE FL 32611

HALL, JERRY F
DEPT BIOL SCIENCES
MISSISSIPPI STATE UNIV
MISS STATE MS 39762

HANCOCK, KENNETH F
BIOLOGY DEPT
BERRY CLG
ST BERRY GA 30149

HANLIN, RICHARD T
PLANT PATHOLOGY DEPT
UNIV OF GA
ATHENS GA 30601

HARDIN, JAMES W
BOTANY DEPT
NC STATE UNIV
RALEIGH NC 27607

HARMON, PAUL J
DEPT OF BOTANY
SOUTHERN IL UNIV
CARBONDALE IL 62901

HARRIS, JOHN W
TENN TECH UNIV
BIOLOGY DEPT
COOKEVILLE TN 38501

HARRISON, FREDERICK W
BIOLOGY DEPT
EASTERN CAROLINA UNIV
WELLSVILLE NC 26723

HART, DACEY G
6449 WALTERS WOODS DR
FALLS CHURCH VA 22044

HARVEY, PENILOPE W
4123 CASA LOMA DR
DECATUR GA 30034

GRELLACH, VICTOR A
BOTANY DEPT
UNIV OF NC
CHAPEL HILL NC 27514

GRODNER, ROBERT M
DEPT OF FOOD SCIENCE
LSU
BATON ROUGE LA 70803

GRUNDSET, E O
BIOLOGY DEPT
S MISSIONARY CLG
COLLEGE DALE TN 37315

HACKNEY, COURTNEY T
DEPT OF BIOLOGY
UNIV OF NC AT WILMINGTON
WILMINGTON NC 28403

HAESLOOP, JOHN G
BIOLOGY DEPT
PFEIFFER CLG
MISENHEIMER NC 28109

HAINS, JOHN J
ZOOLOGY DEPT
CLEMSON UNIV
CLEMSON SC 29631

HALL, DOUGLAS L
PLEASANT HILL T C #11
CARBONDALE IL 62901

HALL, JOHN C
6 CHEROKEE HILLS
TUSCALOOSA AL 35401

HANLEY, ROBERT W
BIOLOGY, P O 1927
UNIV OF ALABAMA
UNIVERSITY AL 35486

HANNAN, RICHARD R
RT 2, HOLT LANE
FRANKFORT KY 40601

HARDMAN, CURTIS H
BOX 72, RT 27
GLENVILLE WV 26351

HARRIS, CHAUNCEY S
DEPT BIOL-UMC 45
UTAH STATE UNIV
LOGAN UT 84322

HARRIS, JOSEPH B
DEPT OF BIOLOGY
UNIV WISCONSIN STEVENS POINT
STEVENS POINT WI 54491

HARRISON, JULIAN R III
DEPT OF BIOLOGY
COLLEGE OF CHARLESTON
CHARLESTON SC 29401

HART, KATHERINE R
212 CLAY ST
BLACKSBURG VA 24060

HARVEY, RAYMOND S
110 IDLEWILD DRIVE
Aiken SC 29801

GRIFFIN, DANA G III
BOTANY-2177 MCCARTY
UNIV OF FLORIDA
GAINESVILLE FL 32611

CRUSECLOSE, NANCY P
749 HILLVIEW STREET
SPARTANBURG SC 29302

GUDE, WILLIAM D
128 PEMBROKE RD
OAK RIDGE TN 37830

HADDEN, E LFA JR
P O BOX 689
WINGATE NC 28174

HAGAN, SAMUEL C
1630 STEWART AVE S W
ATLANTA GA 30310

HALL, ANTHONY B
125 S GARFIELD ST
ARLINGTON VA 22204

HALL, GREENEVILLE H
RER/203 ARGONNE NATIONAL LAB
9700 S CASS AVE
ARGONNE IL 60439

HANLETT, WILLIAM C JR
ZOOLOGY DEPT 36 LONG HALL
CLEMSON UNIV
CLEMSON SC 29631

HANLIN, HUGH G
DIV SCIENCE MATH
USC-AIKEN
AIKEN SC 29801

HARRISON, PERRY D
103 YORK ST
MORGANTON NC 28655

HARLEY, JOHN P
DEPT BIOLOGICAL SCIENCES
EASTERN KENTUCKY UNIV
RICHMOND KY 40475

HARRIS, J P
MATH AND SCIENCE
CHOWAN CLG
MURFREESBORO TN 37855

HARRIS, STEVEN C
ENVIRON DIV ALA CFOL SURVEY
DRAWER D
UNIVERSITY AL 35486

HART, C W JR
2449 WALTERS WOODS DR
FALLS CHURCH VA 22044

HARTENSTINE, RAYMOND
965 BELVOIR RD
MORRISTOWN PA 19401

HARVEY, WILLIAM R
215 17TH STREET #11
TUSCALOOSA AL 35401

HATHAWAY, EDWARD S
P O BOX 5392 N T STATION
DENTON TX 76202

HAYNE, DON W
INST OF STATISTICS
V C STATE UNIV P O BOX 5457
RALEIGH NC 27602

HAYSLETTE, KENNETH D
P O BOX 4000
PENSACOLA FL 32507

HEER, LETTIE M
1343 PRATHER ROAD
LEXINGTON KY 40502

HELFMAN, GENE S
DEPT ZOOLOGY
UNIV OF GEORGIA
ATHENS GA 30602

HEMBERY, MICHAEL S
CTR ENVIRON'TL STUDIES
V F I AND S U
BLACKSBURG VA 24061

HERR, JOHN M JR
BIOLOGY DEPT
UNIV OF SC
COLUMBIA SC 29208

HERRINGTON, EOB
AT 1 BOX 494
MILLEDGEVILLE GA 31061

HILDRETH, PHILIP E
BIOLOGY DEPT
UNIV OF NORTH CAROLINA
CHARLOTTE NC 28223

HILL, TERRY W
BIO DEPT SW AT MEMPHIS
2900 NORTH PARKWAY
MEMPHIS TN 38112

HINKLE, C ROSS
SCIENCE APPL INC
170 OAK RIDGE TURNPIKE
OAK RIDGE TN 37830

HOBBS, HORTON H JR
2438 HANSFIELD RD
FALLS CHURCH VA 22041

HOLLAND, RICHARD D
PO BOX 297
LIVINGSTON AL 35470

HOLLINGSWORTH, M A JR
1125 FROMLEY RD
AVONDALE EST GA 30002

HOLSINGER, JOHN W
BIOLOGY DEPT
OLD DOMINION UNIV
NORFOLK VA 23508

HOPE, ROBERT C
BOX 293
HUIES CREEK NC 27506

HATLEY, JANET R
MATH DEPT
LOUISBOURG COLLEGE
LOUISBOURG NC 27549

HAYNES, ROBERT H
BIOLOGY
PO BOX 1927
UNIVERSITY AL 35496

HEATH, ALAN G
BIOLOGY DEPT
V F I AND S U
BLACKSBURG VA 24061

HEIKKILAINEN, HERMAN J
802 PRESTON AVE
BLACKSBURG VA 24060

HELMS, CARL A
ZOOLOGY DEPT
CLEMSON UNIV
CLEMSON SC 29631

HENRICHSON, CARL E
SCHOOL BIOL SCIENCES
UNIV OF KENTUCKY
LEXINGTON KY 40506

HEPR, LUCRECIA
3611 FOX HALL RD
COLUMBIA SC 29204

HETRICK, L A
1614 NW 12TH RD
GAINESVILLE FL 32605

HILL, DAVID
BELMONT CLG
NASHVILLE TN 37203

HILL, THOMAS J III
240 NORTHWOOD LAKE
NORTHPORT AL 35476

HOGGLAND, ROBERT E
SOUTHERN WOOD SCI LAB
USDA-ARS
STONEVILLE MS 38776

HUBERG, CHRISTIAN M
LAW ENGINEER TESTING CO
2749 DELX ROAD SE
MARIETTA GA 30067

HOLLER, JAMES P
BIOLOGY DEPT
WISCONSIN ST UNIV
PLATTEVILLE WI 53618

HOLLOWAY, HARRY L JR
BIOLOGY DEPT
UNIV OF ND
GRAND FORKS ND 58201

HOLT, PERRY C
BIOLOGY DEPT
1306 CRESTVIEW DRIVE SE
BLACKSBURG VA 24060

HORN, CHARLES N
BIOLOGY DEPT
UNIV OF ALABAMA P O 1927
UNIVERSITY AL 35496

HAWKINS, INFZ L
PO BOX 173
MILLEDGEVILLE GA 31061

HAYS, KATH LANIER
ZOOLOGY DEPT
CLEMSON UNIV
CLEMSON SC 29631

HEER, EDWIN A
501 MAYWOOD ST
MANLIANA FL 32446

HEINEKE, THOMAS E
2356 PACELY PLACE
MEMPHIS TN 38134

HENDERSON, VERNON
BOX 375
GRAMBLING LA 71245

HENZLER, DAVID J
BOX 1031
EUCKHANNON WV 26201

HERRICKS, EDWIN E
CIVIL ENGINEERING
UNIV OF ILLINOIS
URBANA IL 61801

HICKS, MARIE L
BIOLOGY DEPT
APFALACHIAN ST UNIV
DOUGNE NC 28608

HILL, STANFORD R JR
106 OAK ST NR 4
GREENEVILLE NC 27834

HILLIEM, R DAVID
BIOLOGY DEPT
UNIV WISCONSIN-STEVENS POINT
STEVENS POINT WI 54481

HOLERS, HORTON H III
BIOLOGY DEPT
WITTENBERG UNIV
SPRINGFIELD OH 45501

HOFFMAN, GEORGE R
NAT ACADEMY SCIENCES
2101 CONSTITUTION AVE
WASHINGTON DC 20419

HOLLINGSWORTH, FELICIA
1128 FROMLEY RD
AVONDALE EST GA 30002

HOLLOWELL, VICTORIA C
2300 FOREST DRIVE
CHARLOTTE NC 28211

HOUVER, JAN JEFFREY
DEPT OF BIOLOGY
UNIV OF SOUTH FLORIDA
TAMPA FL 33620

HORNER, W ELLIOTT
DEPT PL PATH AND PHYSIOL
VP1 AND SU
BLACKSBURG VA 24061

HORNICK, FREDERICK N 6101 FITZGERIBONS DR COLUMBIA SC 29209	HORTON, JAMES H BOTANY DEPT W CAROLINA UNIV CULLOWHEE NC 28723	HOLCK, DUANE F BIOLOGY DEPT 50 MISSIONARY CLG COLLEGE DALE TN 37315
HOUP, KATHERINE 519 N LEXINGTON AVE ATLANTA KY 40340	HOUSE, HERBERT W JR BOX 2270 ELON COLLEGE ELON COLLEGE NC 27244	HOWARD, CONSTANCE Y ROUTE 9 BOX 947 CLEVELAND TN 37311
HOWARD, R VINCE 96 COBB ST ATHENS GA 30606	HOWE, H PRANCH JR MICROBIOLOG DEPT UNIV OF GA ATHENS GA 30602	HOWE, JON SHANE BOTANY DEPT SOUTHERN ILLINOIS UNIV CARBONDALE IL 62901
HOWELL, G LEON BIOLOGY DEPT MEMPHIS ST UNIV MEMPHIS TN 38152	HOYT, ROBERT D BIOLOGY DEPT WESTERN KY UNIV BOHLENG GREEN KY 42101	HUANG, FENG HOU 316 PLANT SCIENCE BLDG UNIV OF ARKANSAS FAYETTEVILLE AR 72701
HUBBARD, DOROTHY J HEAD NATURAL SCIENCES 17TH AND THE PARKWAY PHILADELPHIA PA 19103	HUCK, ROBIN B 311 CAROL ST CARRBORO NC 27510	HUENALL, MERNIE SUE HENDERSON COMM CLG HENDERSON KY 42420
HULL, JAMES C BIOLOGICAL SCIENCES TOWSON STATE UNIV BALTIMORE MD 21204	HUME, MICHAEL H BIOLOGY DEPT VA COMMONWEALTH UNIV RICHMOND VA 23284	HUMPHRIES, ROBERT L 1597 MILFORD CHURCH RD MARIETTA GA 30060
HUNDLEY, LOUIS R DEPT OF BIOLOGY V M 1 LEXINGTON VA 24450	HUNTER, JAY V BOX 10809 SOUTHERN UNIV BATON ROUGE LA 70813	HUNT, EDWARD J BIOLOGY DEPT EMORY UNIV ATLANTA GA 30322
HUNTER, FRISSELL A PO BOX 10573 SAVANNAH STATE COL SAVANNAH GA 31406	HUNTER, GORDON L BOX 5623 TENN TECH UNIV COOKEVILLE TN 38501	HUNTER, ROY JR BIOLOGY DEPT ATLANTA UNIV ATLANTA GA 30314
HURD, M PATRICIANNE 1965 WHISPERWOOD TR POINT GA 30344	HURT, VALINA K CHAPARRAL APTS 12U1-3 OAKHURST AVE NORMAN OK 73071	HUSBAND, DAVID D BIOLOGY DEPT UNIV OF SC COLUMBIA SC 29208
HYDE, CORNELIA T BIOLOGY DEPT GA SOUTHERN COL STATESBORO GA 30458	HYLTON, ROBERTA E MARINE BIOLOGY DEPT UNIV NC AT WILMINGTON WILMINGTON NC 28406	IVESTEN, M SUSAN PO BOX 386 DAUPHIN ISLAND AL 36528
JACKSON, JAMES F BIOLOGY DEPT UNIV SW LOUISIANA LAFAYETTE LA 70504	JACKSON, JEROME A PO BOX 2 MISSISSIPPI ST MS 39762	JACOB, JAMES S BIOLOGY DEPT MEMPHIS STATE UNIV MEMPHIS TN 38152
JACOBS, JACQUELINE 5 NORTHLAKE RD COLUMBIA SC 29204	JAGER, YETTA 1013 N MARY STREET KNOXVILLE TN 37914	JAKES, CHARLES H ROUTE 12 BOX 31 LEXINGTON NC 27292
JAMES, FRANCES C BIOLOGICAL SCIENCE FLORIDA STATE UNIV TALLAHASSEE FL 32306	JAMES, FREDERICK C BIOLOGY DEPT PRESBYTERIAN COLLEGE CLINTON SC 29325	JANDEBEUR, THOMAS S BIOLOGY ATHENS STATE BOX 215 ATHENS AL 35611
JAYNES, MARY L BOX 330 TUSCULUM COLLEGE GREENVILLE TN 37743	JEFFERS, GFO W 500 FIRST AVE FARMVILLE VA 23101	JEFFERY, GEOFFREY 1037 BLACKSHEAR DR DELAUR GA 30033
JEFFREYS, DONALD H BIOLOGY DEPT EAST CAROLINA UNIV GREENVILLE NC 27834	JENKINS, ROBERT E BIOLOGY DEPT ROANOKE COLLEGE SALEM VA 24153	JENKINSON, JOHN J 1VA FORESTRY PLD MORRIS TN 37829
JENNER, CHAS EDWIN BIOLOGY UNIV OF NC CHAPEL HILL NC 27514	JOHNS, FREDERICK L BOX 79 NORTH ADAMS MA 01247	JOHNSON, DANTON L BIOLOGY DEPT COLLEGE OF CHARLESTON CHARLESTON SC 29401

JOHNSON, DONALD W
HANCOCK BIOL STATION
MURRAY STATE UNIV
MURRAY KY 42071

JOHNSON, T W JR
BOTANY DEPT
DUKE UNIV
DURHAM NC 27706

JONES, RONALD L
T J
OLD HYDES FERRY RD
NASHVILLE TN 37218

JONES, THOMAS H
P O BOX 495
DILLING SPRINGS NC 28017

JUDD, WALTER S
209 ROLFS HALL
UNIVERSITY OF FLORIDA
GAINESVILLE FL 32611

KALMUS, GERHARD A
BIOLOGY
EAST CAROLINA UNIV
GREENVILLE NC 27834

KATHMAN, A DEEDEL
1711 ROBIN HILL RD
FRANKLIN TN 37064

KEFERL, EUGENE P
NATURAL SCIENCES
BRUNSWICK JR CLG
BRUNSWICK GA 31520

KENDALL, DAVID R
SKIDAWAY I OCEANOGRAPH
P O BOX 17697
SAVANNAH GA 31406

KIMERROUGH, JAMES W
BOTANY DEPT
UNIV OF FLORIDA
GAINESVILLE FL 32611

KINGSLAND, GRAYDON C
PLANT PATH DEPT
CLEMSON UNIV
CLEMSON SC 29631

KITTLE, PAUL D
BOX 510
UNIV NORTH ALABAMA
FLORENCE AL 35630

KNEIB, RONALD T
UGA MARINE INSTITUTE
SAPELO ISLAND GA 31327

KOCH, WILLIAM J
BOTANY
UNIV OF NC
CHAPEL HILL NC 27514

KRITTLER, JAMES L
UGA FISH AND WILDLIFE SERV
VERNAL UT 34078

LACEY, ELIZABETH F
BIOLOGY DEPT
UNIV OF NORTH CAROLINA
GREENSBORO NC 27412

JOHNSON, MARTHA J
6949 KAIN ST
LITHONIA GA 30058

JONES, JON DAVID
SOIL CONSERVATION SERVICE
P O BOX 130
STATESBORO GA 30458

JONES, SAMUEL B JR
BOTANY DEPT
UNIVERSITY OF GA
ATHENS GA 30602

JOPSON, HARRY E M
BIOLOGY DEPT
BRIDGEWATER CLG
BRIDGEWATER VA 22812

JUMP, BILLY J
DALTON JR CLG
DALTON GA 30720

KANIADAKIS, STEPHEN J
TIERRA VERDE ISL AND
TIERRA VERDE FL 33715

KEELER, CLYDE F
BOX 325 PES DEPT
CENTRAL ST HOSPITAL
MILLEDGEVILLE GA 31062

KELLER, HAROLD A
BIOLOGY DEPT
WRIGHT STATE UNIV
DAYTON OH 45421

KENT, GEORGE C JR
482 STANFORD AVE
EATON ROUGE LA 70808

KIMERROUGH, T DAN
10300 WALTHAM DRIVE
RICHMOND VA 23213

KIRKMAN, LELIA K
113 HOYT ST
ATHENS GA 30601

KIVIC, PETER A
BOTANY DEPT
UNIV OF TENNESSEE
KNOXVILLE TN 37916

KNIGHT, LUTHER A JR
RT 5
13 LA RHONDA DR
OXFORD MS 38655

KOWALCZYK, BRUNO F
BIOLOGY DEPT
UNIV OF SOUTH CAROLINA
COLUMBIA SC 29208

KRISSINGER, WAYNE A
211 S EDGEWOOD DR
STATESBORO GA 30454

LACEY, R BRUCE
DEPT BIOL SCIENCES
BOX 4-100
COLUMBUS MS 39701

JOHNSON, MILLS F
BIOLOGY DEPT
VA COMMONWEALTH UNIV
RICHMOND VA 23284

JONES, L MICHAEL
BIOLOGY DEPT
UNC AT WILMINGTON
WILMINGTON NC 28406

JONES, STEVEN P
BIOLOGY DEPT
VIRGINIA COMMONWEALTH UNIV
RICHMOND VA 23284

JORDAN, J RALPH JR
OFFICE OF NATURAL RESOURCES
TVA
NORRIS TN 37829

KALINSKY, ROBERT G
BIOL SCIENCES DEPT
LSU SHREVEPORT 70515
SHREVEPORT LA 71115

KARL, PETER I
DEPT BIOLOGICAL SCIENCES
MISSISSIPPI STATE UNIV
MISS STATE MS 39762

KEEVER, CATHERINE
3400 SHAMROCK DRIVE
CHARLOTTE NC 28215

KELLY, JANET J
DEPT OF BIOLOGY
COLLEGE OF CHARLESTON
CHARLESTON SC 29401

KIMBALL, RICHARD F
BIOLOGY DIV BOX Y
OAK RIDGE NATL LAB
OAK RIDGE TN 37830

KING, BRUCE L
APT 61
309 ARLINGTON ST
ASHLANE VA 23005

KITCHINGS, J THOMAS
ENVIRONMENTAL SCI DIV
OAK RIDGE NATL LAB
OAK RIDGE TN 37830

KLIMAS, CHARLES V
502 LONGVIEW ST
VICKSBURG MS 39180

KOCH, LEROY M
1765 EUNICE AVE
FLORENCE AL 35630

KRAEMER, JED E
66 LAVENTHAL AVE
IRVINGTON NJ 07111

KUNZE, DONALD C
BOX 4195
ROANOKE VA 24015

LAFFODAY, SAMUEL K
BIOLOGY DEPT
DE KALB CLG
CLARKSTON GA 30021

LANDT, JAMES F BIOLOGY DEPT UNIVERSITY OF EMORY UNIV OXFORD GA 30602	LANE, DAVID M BOTANY DEPT UNIV OF GEORGIA ATHENS GA 30602	LANGDON, JAMES W BIOLOGY UNIV OF SOUTH ALABAMA MOBILE AL 36689
LANGLEY, ALBERT A JR DAMES AND MOORE ENG SUITE 400 455 PACES FERRY RD ATLANTA GA 30322	LARSON, GARY L UPLANDS FIELD RES LAB GREAT SMOKY MNTNS NATL PARK GATLINBURG TN 37738	LASALLE, MARK W P O BOX 40966 USL LAFAYETTE LA 70504
LASSETTER, J STUART BIOLOGICAL SCIENCES DEPT EASTERN KENTUCKY UNIV RICHMOND KY 40475	LASSITER, RITA BETH 1703 FERRIS AVE TAMPA FL 33603	LATINA, ALBERT A BIOLOGY UNIV OF SOUTH FL TAMPA FL 33620
LAWRENCE, JANE E BOX 3727 CLEMSON UNIV CLEMSON SC 29632	LAWRENCE, THOMAS H III 25 SHEPHERD LANE MEMPHIS TN 38117	LAWSON, VERA SCI AND MATH BETHUNE-COOKMAN COLG DAYTONA BEACH FL 32015
LECHLEITNER, RICHARD A BIOLOGY DEPT VIRGINIA TECH BLACKSBURG VA 24061	LEE, DAVID S MUS OF NATURAL HIST P O BOX 27647 RALLIGH NC 27611	LEFFLER, JOHN W FERRUM COLLEGE FERRUM VA 24089
LELONG, MICHEL E BIOLOGY DEPT UNIV OF S ALABAMA MOBILE AL 36688	LENOIR, WILLIAM C BIOLOGY DEPT COLUMBUS COLG COLUMBUS GA 31907	LEON, LIONEL O 32 TEMPLE AVE SW FT WALTON BCH FL 32549
LESLIE, VIRGINIA K A 379 N SUPERIOR AVE DECATUR GA 30033	LESTELLE, KAREN D 757 ST LOUIS STREET LAFAYETTE LA 70506	LEVER, JOE ANN 135 BRIAN DRIVE SPARTANBURG SC 29302
LEVINE, STEVEN J NATL ATLANTIC RESOURCES LSU BATON ROUGE LA 70802	LEVY, LORELEI S BOX #12657 ETSU JOHNSON CITY TN 37614	LEWIS, PATRICIA H SCI AND MATH DEPT WESLEYAN COLG MACON GA 31201
LIVEN, LAWRENCE H STAR RT 1 BOX 147 PRINCE FREDERICK MD 20678	LIEUX, MEREDITH H DEPT OF BOTANY LOUISIANA ST UNIV BATON ROUGE LA 70803	LILES, JAMES M ZOO AND ENTOMOLOGY UNIV OF TENN KNOXVILLE TN 37916
LINCOLN, JEFFERY L BOARD OF COUNTY COMMISSIONERS SPRABOTA COUNTY FC BOX 8 SPRABOTA FL 33576	LINDAHL, RONALD G BIOLOGY DEPT P O BOX 1927 UNIV OF ALA UNIVERSITY AL 35486	LINDQUIST, DAVID G BIOLOGY UNC-W WILMINGTON NC 28406
LINDSEY, ANNE H CORNER HALL-BOTANY UNC-CH CHAPEL HILL NC 27514	LINK, GARRETT W JR INST MARINE SCI 3407 ARDENELL ST MOREHEAD CITY NC 28557	LIPPS, EMMA LEWIS BIOLOGY DEPT SHORTER COLG ROKE GA 30161
LITCHFORD, R GARY BIOLOGY DEPT UNIV OF TN AT CHATTANOOGA CHATTANOOGA TN 37401	LLEWELLYN, GERALD C 2107 JESSEN RD RICHMOND VA 23229	LOCKE, JOHN F P O BOX 1568 MISSISSIPPI ST MS 39262
LODEN, MICHAEL S DEPT OF ZOOLOGY LSU BATON ROUGE LA 70803	LODGE, THOMAS E BOX 248921 UNIV OF MIAMI CORAL GABLES FL 33124	LODOMAKSINO, JOHN V COLLEGE OF GENERAL STUD UNIV OF SOUTH CAROLINA COLUMBIA SC 29209
LONGEST, PAULINE M 4815 YADKIN RD FAYETTEVILLE NC 28301	LONGEST, WILLIAM D RT 3 BOX 46 OXFORD MS 38655	LOTHERS, JOHN E JR BIOLOGY COVENANT COLLEGE LOUKOUT MTN TN 37350
LOTSFELCH, CAROL S LOTSFELCH AND ASSOCIATES P O BOX 12 WINTER PARK FL 32790	LOVEJOY, BILL P BIOLOGY DEPT GA SOUTHERN COLG STATESBORO GA 30456	LOVELACE, ROBERTA BIOLOGY DEPT UNIV OF SC COLUMBIA SC 29208
LOWRANCE, JON H SP-A BROCKWOOD TERRACE NASHVILLE TN 37205	LOWY, BERNARD MYCOLOGICAL HERBARIUM LA ST UNIV-BOTANY BATON ROUGE LA 70803	LUND, ANNE C 201 4TH AVE FAIRMONT VA 21901

LUTZ, PAUL F BIOLOGY DEPT UNC-CH GREENSBORO NC 27412	LUVALL, JEFFREY C INSTITUTE OF ECOLOGY UNIV. OF GEORGIA ATHENS GA 30602	MACCORMACK, ALAN ZOOLOGY DEPT UNIV OF NORTH CAROLINA CHAPEL HILL NC 27514
MACUREGG, ROBERT III BIOLOGY DEPT UNIV OF ALABAMA IN CHAM BIRMINGHAM AL 35294	MACIOWSKI, ANTHONY DEPT ENVIRONMTL SCI ENGRNG UNIV OF NC CHAPEL HILL NC 27514	MACENZIE, MARK D BOTANY DEPT SOUTHERN ILLINOIS UNIV CARBONDALE IL 62901
MACLEISH, NANDA F BOTANY DEPT UNIV OF GEORGIA ATHENS GA 30602	MADDA, MICHAEL C ZOO DEPT BIOSCI BLDG UNIV OF GEORGIA ATHENS GA 30602	MACDOCK, MICHAEL R DEPT BIOL COLLEGE OF CHARLESTON CHARLESTON SC 29401
MAINWARING, HENRY R BIOLOGY DEPT WESTERN CAROLINA UNIV CULLOWHEE NC 28723	MARI, JON R DEPT NATURAL SCIENCES EASTERN KY UNIV RICHMOND KY 40475	MARARIL, AUGUSTUS SR BIOL SCIENCES DEPT MISSISSIPPI STATE UNIV MISSISSIPPI ST MS 39762
MAREK, WANDA B GRADUATE PROGRAM IN ECOLOGY UNIV OF TENNESSEE KNOXVILLE TN 37916	MAREN, CAROL ANN OFF MAR POL ASSES NOAA ALASKA FIELD OFF P O 1806 JUNEAU AK 99802	MARLEY, JETHRO D DIV OF NATURAL SCIENCES PFEIFFER CLG MISENHEIMER NC 28109
MANNING, RAYMOND I SMITHSONIAN INST 1215 N 3323 WASHINGTON DC 20560	MANSBERG, LAURA BOTANY DEPT ALC STATE UNIV BOX 5186 RALEIGH NC 27650	MARION, PEN K BIOLOGY DEPT UNIV ALA IN BIRMINGHAM BIRMINGHAM AL 35294
MARISCAL, RICHARD N BIOLOGICAL SCIENCES FL STATE UNIV TALLAHASSEE FL 32306	MARLAND, FREDERICK C SAPELO ISL GA 31327	MARLEY, ROBERT D DEPT OF BIOLOGY UNIV OF SOUTH ALABAMA MOBILE AL 36686
MARSHALL, MATTHEW E 9960 N KENDALL DR 6P MIAMI FL 33176	MARTIN, BENJAMIN F JR SCIENCE DEPT LSU AT ALEXANDRIA ALEXANDRIA LA 71301	MARTIN, DONNY D BIOLOGY BELHAVEN CLG JACKSON MS 39202
MARTIN, JAMES H III 4703 BREMER BLVD RICHMOND VA 23299	MARTIN, RICHARD D 151 ATHENS WAY NASHVILLE TN 37226	MARTIN, ROBERT E BIOLOGY DEPT TENN TECH UNIV COCKEVILLE TN 38501
MARTIN, ROBERT H MARTIN INSTRUMENT CO MADE HAMPTON MALL GREENVILLE SC 29609	MARTIN, VIRGINIA L DEPT OF BIOLOGY QUEENS COLLEGE CHARLOTTE NC 28274	MARTIN, WALLACE BIOLOGY DEPT RANDOLPH-MACON CLG ASHLAND VA 23005
MARTIN, WILLIAM H III DIVISION OF NATURAL AREAS EASTERN KENTUCKY UNIV RICHMOND KY 40475	MASSEY, J R BOTANY DEPT-COXER HALL UNC-CH CHAPEL HILL NC 27514	MASSOUD, AHMED A 1050 DAN KUYERDALL MEMPHIS TN 38111
MATHEWS, RAYMOND L JR 753 CIRCLE DR GAILINBURG TN 37738	MATTHEWS, JAMES F BIOLOGY DEPT UNIV OF NC CHARLOTTE NC 28223	MATTHEWS, WILLIAM J O U BIOLOGICAL STATION KINGSTON OK 73439
MATTI-MAELLA, CAROL 1924 WOODFORD RD SE VIENNA VA 22180	MATTIS, TOM E SCIENCE DEPT TUSCULUM COLLEGE GREENVILLE TN 37743	MAY, MARGARET L 6104 N WILKINSON CT RICHMOND VA 23227
MAYBANK, PATHERIVE M 52 KING ST CHARLESTON SC 29401	MCCAFFREY, CHERYL A SAVANNAH RIVER ECOLOGY LAB DRAWER E AIKEN SC 29801	MCLARTHY, JOANNE I 1915-B BROADWAY NEW ORLEANS LA 70116
MCCLENDON, ROBOY JOE PEACH COUNTY HIGH SCH FT VALLEY GA 31030	MCCLENDON, DEL DECKMAN INSTRUMENTS INC 110 TECHNOLOGY PARK NOPCRUSS GA 30092	MCCLEUNG, R MICHAEL 2809-C COTTAGE PL GREENSBORO NC 27405
MCCURKIN, IGLA T BIOLOGY DEPT UNIV OF MISS UNIVERSITY MS 38677	MCCOON, LUCILLE M LOUISIANA NATURE CENTER, INC 11000 LAKE FOREST BLVD NEW ORLEANS LA 70127	MCCORD, RAYMOND 5709 OUTER DRIVE KNOXVILLE TN 37921

MCCORMICK, J FRANK
DIRECTOR GRAD PROG ECOL
UNIV OF TENNESSEE
KNOXVILLE TN 37916

MCCRACKEN, GARY F
ZOOLOGY DEPT
UNIV OF TENNESSEE
KNOXVILLE TN 37916

MCCRAFT, ANNE B
411 SUMMER REST RD
WILMINGTON NC 28401

MCDANIEL, SUSAN J
V CHNCLR ACAD AFFRS
E CAROLINA UNIV
GREENVILLE NC 27834

MCDONALD, CHARLES B
BIOLOGY DEPT
EAST CAROLINA UNIV
GREENVILLE NC 27834

MCDONALD, JAMES C
BOX 7325
WAKE FOREST UNIV
WINSTON SALEM NC 27109

MCDONALD, MARY E B
BIOL DEPT
UNIV ALA IN BIRMINGHAM
BIRMINGHAM AL 35294

MCFADDEN, SAM E
304 HIAWATHA ST
SOMERVILLE TN 38066

MCGHEE, CHARLES R
BIOLOGY DEPT
MIDDLE TENN STATE UNIV
MURFREESBORO TN 37130

MCGREGOR, W H DAVIS
FORESTRY DEPARTMENT
CLEMSON UNIV
CLEMSON SC 29631

MCGUIRE, ROBERT F
224 SECUDIA
MONTEVALLO AL 35115

MCINNIS, THOMAS N JR
BOTANY DEPT
CLEMSON UNIV
CLEMSON SC 29631

McKINLEY, THOMAS R
BIOLOGY DEPT
WARREN WILSON COLG
SWANANOA NC 28778

McLAUGHLIN, ELLEN W
BIOLOGY DEPT
SAMDORD UNIV
BIRMINGHAM AL 35204

McLEOD, KEN
SREL
DRAWER E
AIXEN SC 29801

McMAHAN, MICHAEL L
BIOLOGY DEPT
UNION UNIVERSITY
JACKSON TN 38301

McMICHAEL, ROB H JR
FUNA MARINE RESEARCH LAB
100 EIGHTH AVENUE, S E
ST PETERSBURG FL 33701

McNILLAN MALCOLM L JR
DEPT OF BIOLOGY
UNC-GREENSBORO
GREENSBORO NC 27412

McSTAY, NIAL G
44 NORTH HROADWAY AHS
WHITE PLAINS NY 10603

McTIEH, THOMAS L
DEPT OF PARASITOLOGY
CLG VET MED, UNIV OF GEORGIA
ATHENS GA 30602

MEIGS, RUSSEL A
BIOLOGY DEPT
P O 1927
UNIVERSITY AL 35486

MEIJER, WILLEN
BIOLOGICAL SCIENCES 02251
UNIV OF KY
LEXINGTON KY 40506

MELLICHAMP, T LAWRENCE
BIOLOGY DEPT
UNIV-C STATION
CHARLOTTE NC 28223

MELLINGER, A CLAIR
BIOLOGY DEPT
E MENNONITE CLG
HARRISONBURG VA 22801

MELVIN, NORMAN C
DEPT OF BIOLOGY
ST ANDREWS PRESBYTERIAN CLG
LAUNGBURG NC 28552

MENGEHIER, WILLIAM L
BIOLOGY DEPT
BRIDGEWATER CLG
BRIDGEWATER VA 22612

MENHINICK, EDWARD F
BIOLOGY DEPT
UNIV OF NC
CHARLOTTE NC 28213

MENZEL, MARGARET T
BIOLOGICAL SCI
FL STATE UNIV
TALLAHASSEE FL 32306

MENZEL, R WINSTON
OCEANOGRAPHY
FL STATE UNIV
TALLAHASSEE FL 32306

MERKLE, DONALD A
DEPT OF NATURAL SCIENCES
LONGWOOD COLLEGE
FARMVILLE VA 23901

MEYER, SAMUEL L
1401 NAPOLEAN BOLAPANTE DRIVE
TALLAHASSEE FL 32308

MICHNOLICZ, CASIMIR
911 WEST 2ND ST
HUNTINGTON WV 25701

MIKSCHE, JEROME P
NC STATE UNIV
RALEIGH NC 27650

MILLER, CHARLES E
BOTANY DEPT
OHIO UNIV
ATHENS OH 45701

MILLER, GARY L
BIOLOGICAL SCIENCES
MISSISSIPPI STATE UNIV
MISS STATE MS 39762

MILLER, GROVER C
ZOOLOGY DEPT
P O BOX 5577 NCSU
RALEIGH NC 27650

MILLER, HARVEY A
BIOLOGY DEPT
UNIV OF CENTRAL FLORIDA
ORLANDO FL 32816

MILLER JR, JAMES A
307 SHOREWOOD DR
EAST PALMOUTH MA 02536

MILLER, MARGARET W
BIOLOGY DEPT
UNIV OF S ALABAMA
MOBILE AL 36688

MILLER, WILLIAM W III
BIOLOGY DEPT
V LA UNIV
MONROE LA 71201

MILLICAN, TROY G
BOX 346
SLU STATION
HAYMOND LA 70402

MINKIN, JEREMY P
961 W GOODVIEW DRIVE
VIRGINIA BEACH VA 23464

MITCHELL, THOMAS D
1209 N ATLANTA AVE
SHEFFIELD AL 35660

MITSCH, WILLIAM J
2236 STRATHMOOR BLVD
LOUISVILLE KY 40205

MOBLEY, RONALD W
4700 STILLER ST
RALEIGH NC 27609

MOOLIN, RICHARD F
BIOLOGY
UNIV OF ALABAMA
HUNTSVILLE AL 35807

MUHLERFROCK, ROBERT H
BOTANY DEPT
SIU
CARBONDALE IL 62901

MONACO, PAUL J
DEPT PHYSICS
ETSU
JOHNSON CITY TN 37614

MONA, CARL D BOTANY DEPT UNIV OF GA ATHENS GA 30601	MONTGOMERY, JOSEPH G 1026 ALTA VISTA SARASOTA FL 33577	MOORE, DAVID J VICE PRES ACAD AFFAIRS RAUFORD UNIV RAUFORD VA 24141
MOORE, JACK H 105 COLONIAL DR FLORENCE AL 35630	MOORE, JULIE H 410 ELM ST APT 3 RALEIGH NC 27604	MORAN, ROBERT C DEPT OF BOTANY SOUTHERN ILLINOIS UNIV CARBONDALE IL 62901
MORGAN, ERIC L ENVIRON BIOL RES PROJ BOX 5167 TN TECH UNIV COOKEVILLE TN 38501	MORGAN, LOUISE W 5256 RIVOLI DR MACON GA 31204	MORGAN, SHARON W MISSOURI DEPT CONSERV BOX 180 JEFFERSON CITY MO 65102
MORRISON, RALPH M BIOLOGY DEPT UNCG GREENSBORO NC 27412	MORKOW, ANGELA C 317 JANICE STREET PRATTVILLE AL 36067	MOTT, RALPH L BOTANY DEPT NC STATE UNIV RALEIGH NC 27650
MOUNT, ROBERT H BIOLOGY-ECOTOXICOLOGY UNIV OF TENN KNOXVILLE AL 37930	MROZEK, EDWARD JR DEPT OF BOTANY NORTH CAROLINA STATE UNIV RALEIGH NC 27650	MUELLER, GREGORY M BOTANY DEPT UNIV OF TENN KNOXVILLE TN 37916
MULLINS, J THOMAS BOTANY DEPT UNIV OF FLORIDA GAINESVILLE FL 32611	MUNDY, PHILLIP H DEPT OCEANOGRAPHY OLD DOMINION UNIV NORFOLK VA 23506	MURDY, WILLIAM H BIOLOGY EMORY UNIV ATLANTA GA 30322
MURPHY, GEORGE G Box 530 MIDDLE TENN ST UNIV MURFREESBORO TN 37130	MURRAY, JOAN B 3505 DIAL DR STONE MTN GA 30083	MURRAY, JOSEPH J JR BIOLOGY GILMER HALL UNIV OF VA CHARLOTTESVILLE VA 22901
MUSSELMAN, LYTTON J BIOLOGY DEPT OLD DOMINION UNIV NORFOLK VA 23506	NABHOLZ, J VINCENT 13427 BENTLEY CIRCLE WOODBRIDGE VA 22192	NAKOSTEEN, PAULA C RT 1 BOX 71 ELAINE TN 37709
NAGVI, SYED M PO BOX 11224 SOUTHERN UNIV BATON ROUGE LA 70817	NATELLA, DAVID W 1929 WOODFORD RD SE VIENNA VA 22180	NAYLOR, AUBREY W BOTANY DEPT DUKE UNIV DURHAM NC 27706
NEFF, STUART C WATER RESOURCES LAB UNIV OF LOUISVILLE LOUISVILLE KY 40292	NELSON, CHARLES H BIOL DEPT UNIV TENN CHATTANOOGA CHATTANOOGA TN 37401	NELSON, DIANE R Box 22900A E TENN ST UNIV JOHNSON CITY TN 37614
NESOM, GUY L BIOLOGY DEPT MEMPHIS STATE UNIV MEMPHIS TN 38152	NESTER, ROBERT W 5905 HEATHERWOOD CT MOBILE AL 36618	NEUFELD, HOWARD BOTANY DEPT UNIV OF GEORGIA ATHENS GA 30602
NEWTON, J CREY J75 ARNOLD ROAD APT AA-101 MOBILE AL 36608	NICHOLSON, RICHARD B BIOLOGY DEPT VIRGINIA POLYTECH INST AND SU BLACKSBURG VA 24061	NICKLAS, SHEILA C ANATOMY DEPT DUKE UNIV MED CTR DURHAM NC 27710
NICKRENT, DANIEL L DEPT BIOL-GILMER HALL UNIV OF VA CHARLOTTESVILLE VA 22901	NIEDERLEHNER, BARBARA BIOLOGY DEPT V P 1 AND STATE UNIV PLACKSBURG VA 24061	NIXON, AILEEN L RT 1 BOX 111 LIVINGSTON AL 35470
NOGGLE, GLENN R PROFESSOR EMERITUS 2346 CHURCHILL RD RALEIGH NC 27608	NORBY, DARWIN E 45517 244TH AVE SE ENUMCLAW WA 98022	NORRIS, FRED H BOTANY DEPT UNIV OF TENN KNOXVILLE TN 37916
NORRIS, WILLIAM W JR BIOLOGY DEPT NE LA UNIV MONROE LA 71203	NUNNALLY, DAVID A Box 1012 VANDERBILT UNIV NASHVILLE TN 37235	NUSSBAUM, FRANCIS E JR BIOLOGY DEPT UNION COLLEGE BARBOURVILLE KY 40906
NYL, THOMAS G BIOLOGY DEPT WASHINGTON AND LEE UNIV LEXINGTON VA 24450	OGARA, CHRISTOPHER J BIOLOGY DEPT TENNESSEE TECH UNIV COOKEVILLE TN 38501	OCUNNELL, J E NO 1017 4200 CATHEDRAL AVE NW WASHINGTON DC 20016

ORUM, EUGENE P ZOOLOGY DEPT UNIV OF GA -THENS GA 30601	OGLE, DOROTHY K A P O BOX 7541 BIRMINGHAM AL 35253	OGLE, DOUGLAS W VA HIGHLANDS COMTY COLLEGE ABINGDON VA 24210
OKELLEY, J CHARLES P O BOX 1927 UNIV OF ALA UNIVERSITY AL 35486	OLEWINE, DONALD A BIOLOGY DEPT GA SOUTHERN CLG STATSBORO GA 30458	ONEIL, PATRICK F GEOL SURVEY OF ALA DRAWER O UNIVERSITY AL 35486
ONEILL, ELLEN JEANNE 107 CENTRAL AVE AARINGTON FL 34507	OQUINN, SARAH RUTH BIOLOGICAL SCIENCES MISS STATE UNIV MISSISSIPPI ST MS 39762	ORNES, W HAROLD SCIENCE AND MATH DEPT UNIV OF SC-AIKEN AIKEN SC 29801
ORSER, JUDITH A BOX 3177 DUKE UNIVERSITY DURHAM NC 27710	OSBURN, PAUL J BIOLOGY DEPT LYNCHBURG CLG LYNCHBURG VA 24501	OSBORNE, THOMAS S BOX 337 RFD 2 MIFFLINTOWN PA 17059
OSKINS, WANDA S BOTANY DEPT SOUTHERN ILL UNIV CARBONDALE IL 62901	OTT, MARGARET E 110 SANFORD AVE OPELIKA AL 36801	OTTE, DEBORAH KAY BOTANY BOX 54 UNC-COKER HALL CHAPEL HILL NC 27514
OUTTEN, L N BIOLOGY DEPT PARKS HILL CLG, 742-C PARKS HILL NC 28754	OWEN, H MALCOLM BIOLOGY DEPT UNIV OF THE SOUTH SEWANEE TN 37375	PALMER, JENNIFER S DEPT OF BIOLOGY UNIV OF SOUTH CAROLINA COLUMBIA SC 29209
PARDUE, W JEFFREY 402 WRIGHT DR FLORENCE AL 36601	PARKER, ALBERT J DEPT OF GEOGRAPHY UNIV OF GEORGIA ATHENS GA 30602	PARKER, BERNARD PRESIDENT PARCO SCIENT COMP PO BOX 595 VIENNA OH 44473
PARKER, JAMES C BIOLOGY DEPT NORTH GEORGIA CLG DANLENGA GA 30533	PARKER, KATHLEEN C 225 TALL TREE RD FOGART GA 30622	PARKER, NICK C U S FISH AND WILDLIFE SERVICE RT 3 BOX 86 MARION AL 36756
PARKER, ROBERT S P O BOX 26 BELLE CHASSE LA 70037	PARKS, JAMES C DEPT BIOL MILLERSVILLE STATE COLLEGE MILLERSVILLE PA 17551	PARNELL, JAMES F BIOLOGY DEPT UNC-WILMINGTON WILMINGTON NC 28401
FARR, PATRICIA D BOX 1525 OAK RIDGE NATL LAB OAK RIDGE TN 37830	PARRISH, FRED K GA STATE UNIV-BIOLOGY UNIV PLAZA ATLANTA GA 30303	PARSONS, KEITH A 2419 HARRINGTON DR DECATUR GA 30033
PATRICK, THOMAS S BOTANY DEPT UNIV TENNESSEE KNOXVILLE TN 37916	PATTEN, JOHN A BIOLOGY DEPT MIDDLE TENN ST UNIV MURFREESBORO TN 37130	PATTON, SHARON VETERINARY PATHOBIOLOG UNIV OF TENN KNOXVILLE TN 37916
PAV, DENISE I BIOLOGY DEPT EAST TENN ST UNIV JOHNSON CITY TN 37601	PAVLOVIC, NOEL B 443 ASH STREET MORGANTOWN WV 26505	PAYNE, JAMES F BIOLOGY DEPT MEMPHIS ST UNIV MEMPHIS TN 38152
PECOFF, RICHARD A LEFT E10L BOX 42451 LAFAYETTE LA 70504	PEDIGO, ROBERT A EDUCATION DEPT IDA C CALLAWAY FOUNDAT PINE MOUNTAIN GA 31322	PEET, ROBERT A COKER HALL UTGA UNC-BOTANY CHAPEL HILL NC 27514
PENNINGTON, TULLY S 1710 FAIR RD T 7 STATSBORO GA 30458	PENNINGTON, WENDELL GRADUATE PROGRAM IN ECOLOGY 691 DABNEY, UNIV OF TENNESSEE KNOXVILLE TN 37916	PERHAM, JAMES E BIOL DEPT RANDOLPH-MACON WOMANS CLG LYNCHBURG VA 24503
PERINO, CHARLES H 6910 INRIQUE DRIVE AUSTIN TX 78745	PERKINS, BRETTA E BOTANY DEPT UNIV OF TENN KNOXVILLE TN 37916	PERKINS, FRANK O VA INST OF MARINE SCI GLOUCESTER PT VA 23062
PERKINS, KENNETH W BOX 396 ELON COLLEGE NC 27244	PERRY, GERRY BIOL DEPT - CLG OF SCIENCES SAN DIEGO STATE UNIV SAN DIEGO CA 92182	PERRY, H RANDOLPH JR 14029 BRIARWOOD DR LAUREL MD 20811

PERRY, JAMES D
DEPT OF BIOLOGY
UNIV OF NC AT ASHEVILLE
ASHEVILLE NC 28804

PETERSEN, RAYMOND L
131 URELL PLACE N E
WASHINGTON DC 20011

PHILLIPPE, LOY R
KY NATURE PRESERVES COMM
407 ERADWAY
FRANKFORT KY 40601

PIELOU, WILLIAM P
IOLOGY
FURMAN UNIV
GREENVILLE SC 29613

PINGEL, ALLEN L
12535 SUNNY BROOK RD
SAVANNAH GA 31406

PITTS, MARY L
INSTITUTE OF ECOLOGY
UNIV OF GEORGIA
ATHENS GA 30602

PLUMMER, GAYTHER L
INST NATURAL RESOURCES
UNIV OF GA
ATHENS GA 30602

POSTEK, MICHAEL T
BOTANY DEPT
LOUISIANA STATE UNIV
BATON ROUGE LA 70803

POTTER, JEANNE
1900 NW PENNA PEOPLE ENV AFFRS
WASHINGTON DC 20068

POWELL, ROBERT W JR
IOLOGY DEPT
CONVERSE CLC
SPARTANBURG SC 29301

PRICE, ALBERT H
1541 HELTON DR APT A103
FLORENCE AL 35630

PRICE, JANET H
1541 HELTON DRIVE
APT A-103
FLORENCE AL 35630

PRINZ, RUDOLPH
IOLOGY DEPT
WESTERN KENTUCKY UNIV
HOWLING GREEN KY 42101

PULLMAN, THOMAS M
IOLOGY DEPT
UNIV OF MISS
UNIVERSITY MS 39277

QUICK, FRANK W JR
IOLOGY DEPT
MARKS HILL CLG
MARKS HILL NC 28754

RAFAILL, WILLIAM S
IOLOGY C P O BOX 1730
BEREA COLLEGE
BEREA KY 40404

PERRY, MIRIAM P
IOLOGY DEPT
CLAYTON JR CLG
MORROW GA 30260

PETRANKA, JAMES W
IOLOGY-MORGAN CLG
UNIV OF KY
LEXINGTON KY 40506

PHILLIPPI, MARY ANN
T H MORGAN BLDG BIOL SCIENCES
UNIV OF KENTUCKY
LEXINGTON KY 40506

PILATOWSKI, RONALD E
BOTANY DEPT OSU
1735 NEIL AVE
COLUMBUS OH 43210

PINSON, JOSEPH N JR
IOLOGY
COASTAL CAROLINA CLG
CONWAY SC 29526

PLATANIA, STEVEN P
NC STATE MUSEUM NAT HIST
P O BOX 27647
RALEIGH NC 27611

POLY, DENNIS M
511 CRESTWOOD DR
CLINTON TN 37716

POTTER, ELOISE F
BOX 114-AA
RT 3
ZEBULON NC 27597

POWERS, VERNON N
IOLOGY DEPT
NORTHWEST OKLAHOMA STATE UNIV
ALVA OK 73717

POWER, MARTHA S
IOLOGY DEPT
GEORGE MASON UNIV
FAIRFAX VA 22030

PRICE, JAMES A JR
BIOL SCIENCES P O DRAWER GY
MISSISSIPPI STATE UNIV
STATE COLLEGE MS 39762

PRICE, RICHARD E
US ARMY CORPS OF ENGINEERS
VICKSBURG DISTRICT P O BOX 60
VICKSBURG MS 39180

PUDDY, ROBERT E
USC-CLG OF GEN STUDIES
CAROLINA COLISFUM
COLUMBIA SC 29208

PUSATERI, WILLIAM P
BOTANY DEPT
MIAMI UNIV
OXFORD OH 45056

RADER, LINDA L
BIOL DEPT
WEST VIRGINIA UNIV
MORGANTOWN WV 26506

RAGSDALE, HARVEY L
BIOLOGY DEPT
EMORY UNIV
ATLANTA GA 30322

PEIERS, DANIEL J
BOX 547
CHRISTOPHER NEWPORT CLG
YORKTOWN VA 23690

PHILIPS, HARRIETTE L
UNIV OF D C
1331 H STREET NW
WASHINGTON DC 20005

PHILLIPS, DONALD L
DEPT BIOLOGY
EMORY UNIV
ATLANTA GA 30322

PINDER, JOHN E III
SREL
PO DRAWER E
Aiken SC 29801

PITTILLO, J DAN
BIOLOGY DEPT
WESTERN CAROLINA UNIV
CULLOWHEE NC 28727

PLUMBLEE, BARBARA I
BOX 2161
ELON COLLEGE
ELON COLLEGE NC 27244

PORCHEW, RICHARD D JR
BIOLOGY DEPT
THE CITADEL
CHARLESTON SC 29409

POTTER, ISABEL
1059 EMEZEZER AVE EXT
ROCK HILL SC 29730

POWELL, MARTHA J
BOTANY
MIAMI UNIV
OXFORD OH 45056

POZNER, ROBERT S
BIOL DEPT
WESTERN CAROLINA UNIV
CULLOWHEE NC 28727

PRICE, JAMES O
BIOLOGY DEPT
MEMPHIS STATE UNIV
MEMPHIS TN 38152

PRICE, THOMAS J
BOX 437
BEAUFORT NC 28516

PUGH, JEAN F
CHRISTOPHER NEWPORT COLLEGE
50 SHOE LANE
NEWPORT NEWS VA 23606

QUARTERMAN, ELSIE P
1313 BELMONT PK COURT
NASHVILLE TN 37215

RAUFORD, ALBERT E
BOTANY DEPT
UNIV OF NC
CHAPEL HILL NC 27514

RAMAGE, DONALD R
BIOLOGY DEPT
BELMONT COLLEGE
NASHVILLE TN 37203

RAMSEY, ROBERT C BIOLOGY DEPT MARTINVILLE COLLEGE MARTINVILLE TN 37801	RAMSEUR, GEORGE S BOX 1218 UNIV OF THE SOUTH SEWANEE TN 37375	RAMSEY, GWYN W BIOLOGY DEPT LYNCHBURG COLLEGE LYNCHBURG VA 24504
RAMSEY, J S FISHERIES AND ALLIED AQUA AUBURN UNIV AUBURN AL 36849	RANASINGHE, JOHN A 601 VILLAGE GREEN DRIVE E APT 84 MOBILE AL 36609	RAPER, C DAVID JR SOIL SCIENCE NC STATE UNIV RALEIGH NC 27607
RASCH, ELLEN M 1801 GALEN DRIVE JOHNSON CITY TN 37601	RAULFSON, C LYNN BIOL-UNIV OF GUAM PO BOX 8K AGUANA GUAM 96910	RAY, CHARLES JR BIOLOGY DEPT EMORY UNIV ATLANTA GA 30322
RAYLE, MICHAEL F STIMBLE AND ASSOC P O BOX 865 METairie LA 70004	REDDISH, PAUL S PO BOX 275 ELON COLLEGE NC 27244	REEDMOND, WILLIAM H OFFICE NATURAL RESOURCES TVA MORRIS TN 37828
REED, CLYDE T 3202 N. ROME AVE TAMPA FL 33607	REED, JAMES R JR 813 FORREST DRIVE NEWPORT NEWS VA 23606	REESE, WILLIAM D DEPT OF BIOLOGY BOX 42451 USL STA UNIV SOUTHERN LA LAFAYETTE LA 70504
REGISTER, THOMAS E BOTANY SLIDE DEPT CAROLINA BIOLOGICAL SUPPLY CO LUXINGTON NC 27215	REID, GEORGE K BIOLOGY DEPT ECKERD COLLEGE ST PETERSBURG FL 33711	REMBERT, DAVID W JR BIOLOGY UNIV OF SC COLUMBIA SC 29208
RENZAGLIA, KAREN S DEPT BIOLOGICAL SCI EAST TENN STATE UNIV JOHNSON CITY TN 37601	RESTIVO, JOE H BIOLOGY DEPT ARMSTRONG STATE COLLEGE SAVANNAH GA 31406	REYNOLDS, JOHN D VCU-BIOLOGY 816 PARK AVE RICHMOND VA 23284
RICE, NOLAN E BIOLOGY DEPT UNIV OF RICHMOND RICHMOND VA 23173	RICHARDSON, ANNIE L BIOLOGY DEPT NORFOLK ST COLLEGE NORFOLK VA 23504	RICHARDSON, DONALD R BIOLOGY DEPT UNIV OF SOUTH FLORIDA TAMPA FL 33620
RIEPEL, JAMES L BIOLOGY DEPT UNIV OF VA CHARLOTTESVILLE VA 22903	RISLEY, LANCE S 207 ALDER LN OAK RIDGE TN 37830	RITCHIE, JERRY C USDA ARS BARC WEST BLDG 005 NPS SOIL WATER AIR EELTSVILLE MD 20705
ROBERTS, JANICE W JEFFERSON ST JR COLLEGE 1401 CARSON RD BIRMINGHAM AL 35215	ROBERTSON, PHILIP A BOTANY DEPT S I U CARBONDALE IL 62901	ROBINSON, HENRY W SOUTHERN ARKANSAS UNIV P O BOX 1214 MAGNOLIA AR 71753
ROBINSON, WILLIAM A 1312 CHINOCK TRAIL APT 4 FRANKFORT KY 40601	RODEWALD, RICHARD D BIOL DEPT UNIV OF VIRGINIA CHARLOTTESVILLE VA 22901	RODGERS, C LELAND BIOLOGY DEPT FURMAN UNIV GREENVILLE SC 29613
ROEDER, MARTIN BIOLOGICAL SCIENCES FL STATE UNIV TALLAHASSEE FL 32304	ROGERS, HOLLIS J BIOLOGY DEPT UNCG GREENSBORO NC 27412	ROGERS, JAMES S BIOLOGICAL SCIENCES UNIV NEW ORLEANS NEW ORLEANS LA 70122
ROMME, WILLIAM H NATURAL SCIENCE DEPT EASTERN KENTUCKY UNIV RICHMOND KY 40475	ROOP, TOM BIOL DEPT FRANCIS MARION COLLEGE FLORENCE SC 29501	ROSE, ROBERT D BIOLOGY DEPT EMORY UNIV ATLANTA GA 30322
ROSENKRANZ, ANN M 1943 HAVENWOOD PL ALEXANDRIA VA 22309	ROSS, JAMES W BOTANY ST JOHN PL SCI LAB UNIV OF HAWAII 3190 MAILE WAY HONOLULU HI 96812	ROSS, STEPHEN T SS BOX 5013 DEPT BIOL UNIV SOUTHERN MISS HATTIESBURG MS 39401
ROYER, ISABEL I 13 RINGE RD WEATMINSTER MD 21157	RUPP, NELL E B RT 1 BOX 90A IRONSDALE MI 49644	RUNY, GERALD BIOLOGY DEPT THE CITADEL CHARLESTON SC 29409
RUNY, MARTHA W BIOLOGY DEPT COLLEGE OF CHARLESTON CHARLESTON SC 29401	RUNK, R F D BOX 263 RT 1 TROY VA 22974	RUFFERT, EARLENE A AGRONOMY AND SOILS CLEMSON UNIV CLEMSON SC 29631

USHTON, PHISCILLA S
BIOLOGY DEPT
MEMPHIS ST UNIV
MEMPHIS TN 38152

RYAN, EDWARD P
BIOLOGY DEPT
CAROLINA UNIV
GREENVILLE NC 27834

SAFRIT, GLENN W JR
UNC INSTITUTE MARINE SCI
PO DRAWER 809
MOREHEAD CITY NC 28557

SAUELSON, DON A
STANTY-MCCARTY HALL
UNIV OF FL
GAINESVILLE FL 32611

SAWYER, GEORGE P JR
BIOLOGY DEPT
LOCKER CLG
HARTSVILLE SC 29552

SCHMIDT, JOHN E
P O BOX 43
COOKVILLE TN 38501

SCHOENIKE, ROLAND E
DEPT OF FORESTRY
CLEMSON UNIV
CLEMSON SC 29631

SCHUTT, JOHN ROBERT
2114 LINCOLN ST
KNOXVILLE TN 37920

SCOTT, DAVID L
ENVIRONMENTAL EDUCATION
PO BOX 1327 CO PUB SCH
MOBILE AL 36601

SCOTT, WILLIAM W
BOTANY DEPT
36 CIRCLE DRIVE
CHARLESTON IL 61940

SEAGLE, STEVEN W
ECOLOG
UNIVERSITY OF TENNESSEE
KNOXVILLE TN 37916

SELLERS, CLETUS M JR
BIOLOGY DEPT
JAMES MADISON UNIV
HARRISONBURG VA 22807

SHABICA, STEPHEN V
COASTAL RESEARCH LAB
VATL PARK SERVICE
NSTL ST MS 3529

SHANOR, LELAND
BOTANY DEPT
UNIV OF FLORIDA
GAINESVILLE FL 32611

SHARMA, GOPAL K
BIOLOGY DEPT
UNIV OF TN
MARTIN TN 38238

SHAW, WILLIAM N
2709 P STREET
LUREKA CA 95501

RUSKA, WILLIAM F JR
RFD 1 BOX 332D
PULASKI VA 24301

RYON, MICHAEL G
303 HIGHTSTONE LN
KNOXVILLE TN 37922

SALADIN, KENNETH S.
BIOL AND ENVIRON SCI
GEORGIA COLLEGE
MILLEDGEVILLE GA 32301

SANDERSON, WILLIAM E
MUSEUM OF ZOOLOGY
LSU
BATON ROUGE LA 70893

SCHERING, JOSEPH F
BIOL DEPT U OF ALA
P O 1927
UNIVERSITY AL 35486

SCHMIDT, ROGER P
CLG GENERAL STUDIES
UNIV SOUTH CAROLINA
COLUMBIA SC 29208

SCHRAMM, JOAN C
1676 6TH AVE
HUNTINGTON WV 25703

SCHWARTZ, FRANK J
INSTITUTE MARINE SCI
UNC
MOREHEAD CITY NC 28557

SCOTT, DONALD C
BEECH CREEK RD
ATHENS GA 30606

SEABURY, FRANK JR
BIOLOGY DEPT
THE CITADEL
CHARLESTON SC 29409

SEEHORN, MONTE L
255 SW CHURCH ST
PUFORD GA 30516

SELLERS, GEORGE L
205 TANGLEWOOD RD
SAVANNAH GA 31406

SHADOWFN, HERBERT E
BIOLOGY DEPT
WESTERN KY UNIV
BOWLING GREEN KY 42101

SHAPIRO, MARGUERITA L
ROUTE 1 BOX 281
THEODORE AL 36582

SHARP, AARON J
BOTANY DEPT
UNIV OF TENN
KNOXVILLE TN 37916

SHEALY, HARRY E JR
BIOLOGY DEPT
704 S BOUNDARY AVE
AIKEN SC 29801

RYALS, PHILLIP E
BIOLOGY DEPT
TROY STATE UNIV
TROY AL 36081

SABINS, DUGAN S
COASTAL ENVIRONMENTS INC
1260 MAIN STREET
BATON ROUGE LA 70802

SALTERS, GRACE H
BOX 2013
SC STATE COLLEGE
ORANGEBURG SC 29115

SATTERFIELD, JAMES B
BIOLOGY GA ST UNIV-P94
33 GILMER ST
ATLANTA GA 30303

SCHMALZER, PAUL ALAN
ECOLOG 691 OLD DARNEY HALL
UNIV OF TENN
KNOXVILLE TN 37916

SCHMIEGER, LUCILLE A
BIOLOGY DEPT
ITHACA COLLEGE
ITHACA NY 14850

SCHUBAUER, JOSEPH P
UNIV OF GEORGIA MARINE INST
SAFLO ISLAND GA 31327

SCOTT, A FLOYD
DEPT OF BIOLOGY
AUSTIN PEAY STATE UNIV
CLARKSVILLE TN 37040

SCOTT, TAYLOR C III
BOTANY DEPT
SIU
CARBONDALE IL 62901

SEAGLE, HENRY H JR
CNTR ENVIRNMTL STUDY
VPI AND SU
BLACKSBURG VA 24061

SEIDENBERG, ARTHUR J
BIOLOGY DEPT
VA COMMONWEALTH UNIV
RICHMOND VA 23284

SEYLE, WIN
5505 WATERS DR
SAVANNAH GA 31406

SHAFFER, SHANNON C
7655 SPRENKLE COURT
RICHMOND VA 23228

SHARITZ, REBECCA R
SAVANNAH RIV ECOL LAB
DRAWER E
AIKEN SC 29801

SHARP, HOMER F JR
57 MEADOW LANE
COWINGTON GA 30209

SHELLFY, ROWLAND M
N C STATE MUSEUM
PO BOX 27647
RALEIGH NC 27611

SHERROD, CASEY JR
SAVANNAH RIVER ECOL LAB
DRAWER E
AIKEN SC 29801

SHERWOOD, WILLIAM A
BIOLOGY DEPT
LYNCHBURG COL
LYNCHBURG VA 24501

SHETLER, STANWYN G
BOTANY DEPT-NHB 166
US NATL MUSEUM
WASHINGTON DC 20560

SHETTY, A SUBBAYYA
FLORIDA A AND M UNIV
BOX 222
TALLAHASSEE FL 32307

SHIPP, ROBERT L
BIOL DEPT
UNIV SOUTH ALABAMA
MOBILE AL 36688

SHIRLEY, INEZ U
PO BOX 3113
INDIANALANTIC FLA 32903

SHIRLEY, THOMAS L
ZOOLOGY
LSU
BATON ROUGE LA 70803

SHORT, ROBERT B
BIOLOGICAL SCI
FL STATE UNIV
TALLAHASSEE FL 32306

SHOUP, CHARLES S
80 OUTER DR
OAK RIDGE TN 37830

SHULL, J KENNETH JR
LOYOLA UNIV BIOL DEPT
5363 ST CHARLES AVE
NEW ORLEANS LA 70118

SHURE, DONALD J
BIOLOGY DEPT
EMORY UNIVERSITY
ATLANTA GA 30322

SHUTE, JOHN R IV
BIOL DEPT
UNC-WILMINGTON
WILMINGTON NC 28401

SHUTE, PEGGY WRIGHT
BIOL DEPT
UNC-WILMINGTON
WILMINGTON NC 28401

SICKEL, JAMES B
BIOLOGY DEPT
MURRAY STATE UNIV
MURRAY KY 42071

SIMPSON, JENNIFFER S
4329 MEMORIAL DR, SUITE C
DECATUR GA 30032

SIMS, ASA C JR
BIOLOGY DEPT
SOUTHERN UNIV IN NEW ORLEANS
NEW ORLEANS LA 70122

SKEAN, JAMES D JR
DEPT OF BOTANY BOX 5186
NORTH CAROLINA ST UNIV
RALEIGH NC 27650

SKLEN, JAMES N
553 N SUPERIOR AVE
DECATUR GA 30033

SKILLEN, STEVEN W
2056 ROSLYN AVE
BALTIMORE MD 21237

SKOG, JUDITH E
BIOLOGY DEPT
GEO MASON UNIV
FAIRFAX VA 22030

SLANTZ, RUTH P
BIOLOGY DEPARTMENT
MERCER UNIV
MACON GA 31207

SLIGER, AILBURU P
BIOL DEPT
UNIV TENN AT MARTIN
MARTIN TN 38238

SLONE, KENNETH M
PO BOX 481
HINDMAN KY 41822

SMALL, JAMES W JR
BIOLOGY DEPT
ROLLINS COL
WINTER PARK FL 32789

SMART, ROBERT F
7003 UNIVERSITY DR
RICHMOND VA 23249

SMITH, ARLO I
3724 OAKLEY AVE
MEMPHIS TN 38111

SMITH, BRUCE B
YORK COL OF PA-BIOLOGY
COUNTRY CLUB RD
YORK PA 17405

SMITH, ELIZABETH L
1805 N WASHINGTON BLVD #107
ARLINGTON VA 22205

SMITH, GERALD L
BOTANY DEPT
UNIVERSITY OF GEORGIA
ATHENS GA 30602

SMITH, HARRIET E
BIOL DEPT P O BOX 1927
UNIV OF ALABAMA
UNIVERSITY AL 35486

SMITH, MICHAEL H
SAVANNAH RIVER ECOL LAB
DRAWER E
AIKEN SC 29801

SMITH, SEPTIMA C
4301 BRIARHAVEN RD
FORT WORTH TX 76109

SMOLEN, MICHAEL D
RT 4 BOX 16R
BLACKSBURG VA 24060

SMOTHERS, ELIZABETH C
473 RIVERSIDE DRIVE
LOUISVILLE KY 40207

SMOTHERS, JAMES L
BIOLOGY DEPT
UNIV OF LOUISVILLE
LOUISVILLE KY 40208

SMUCKER, JERRY C
331A KING WILLIAM DR
OLNEY MD 20832

SNOOK, VIRGIL P JR
BIOLOGY DEPT
WEST GEORGIA COL
CARROLLTON GA 30118

SPELCE, DAVID LEE
7732 NEWPORT AVE
NORFOLK VA 23505

SPLNCE, LORRAINE B
315 WHITE OAK DRIVE
CARY NC 27511

SPIETH, ALDA M
1704 SPRING HILL AVE
MOBILE AL 36604

SPONHOLTZ, GLEN M
BOX 183
RT 9
TALLAHASSEE FL 32303

SPOONER, JOHN D
BIOLOGY
UNIV OF SC
AIKEN SC 29801

SPRAGUE, ELIZABETH F
BIOLOGY DEPT
SWEET BRIAR COL
SWEET BRIAR VA 24595

SPRUGEL, GEORGE JR
2710 S FIRST ST
CHAMPAIGN IL 61820

STACK, JACQUELINE C
ROUTE 2 BOX 117
CELANO HILL TN 37032

STAIR, BARBARA L
P O BOX 495
TUSCULUM COLLEGE
GREENEVILLE TN 37743

ST AMAND, WILBROD JR
BIOLOGY DEPT
UNIV OF MISS
UNIVERSITY MS 38677

STALTER, RICHARD
ENVIRONMENTAL STUDY PROG
ST JOHNS UNIV
JAMAICA NY 11430

STANSPURY, DAVID H
MUSEUM OF ZOOLOGY
OHIO ST UNIV
COLUMBUS OH 43210

STARNES, LYNN B
AT 14 RIDGEVIEW ROAD
KNOXVILLE 37919

STAUFFER, JAY R
APPALACHIAN ENVIR LAB
UNIV OF MARYLAND
FROSTBURG MD 21552

STEWART, BOBBIE JEAN
105 OAK CIRCLE
SUMMERVILLE SC 29463

STOKES, DARRELL W
ZOOLOGY DEPT
EMORY UNIV
ATLANTA GA 30322

STRATTON, LEWIS P
ZOOLOGY DEPT
FURMAN UNIV
GREENVILLE SC 29613

STUCKY, JOHN M
BOTANY DEPT
NCSU
RALEIGH NC 27650

STYRON, CLARENCE E
CONSANTO RESEARCH CORP
P O BOX 32
MIAMI BEACH FL 33132

SULLIVAN, ROBERT L
X 7325 REYNOLDA STA
WINSTON SALEM NC 27109

SWARTLEY, WILLIAM A
BOX 5615
TENNESSEE TECH UNIV
COOKEVILLE TN 38501

TABATABAI, REBECCA M
ZOOLOGY DEPT
MEMPHIS STATE UNIV
MEMPHIS TN 38117

TARTER, DONALD C
ZOOLOGY DEPT
MARSHALL UNIV
HUNTINGTON WV 25701

TEARE, CATHERINE A
ZOOLOGY DEPT
P O 1927
UNIVERSITY AL 35466

THOMAS, JUDITH F
7006 GARDNER HALL
NC STATE UNIV
RALEIGH NC 27607

THOMPSON, J RICHARD
1670 F CLIFTON AVE NE
ATLANTA GA 30307

TIETJEN, WILLIAM J
ZOOLOGY DEPT
GEORGIA COLLEGE
MILLEDGEVILLE GA 31061

STANTON, GEORGE E
BIOLOGY DEPT
COLUMBUS CLG
COLUMBUS GA 31907

STARNES, WAYNE L
DEPT OF ZOOLOGY
UNIV OF TENNESSEE
KNOXVILLE TN 37916

STEARNS, LARRY M
1229 MARWOOD TERR
CHARLOTTE NC 28209

STIVEN, ALAN E
ZOOLOGY DEPT
UNIV OF NC
CHAPEL HILL NC 27514

STORDIVANT, HARWELL
712 WASHINGTON RD
WESTMINSTER MD 21157

STUART, CAROL DIANE
812 WILSTOVER AVE
NORFOLK VA 23507

STUMP, ALEX B
BOX 57 RT 1
CROSSHILL SC 29332

SUDHAMANYAN, C B
BOX 222
FAMU CAMPUS
TALLAHASSEE FL 32307

SUTTER, ROBERT D
FL CONSERV PROG NC DEPT AGRIC
P O BOX 27647
RALEIGH NC 27611

SWINDOLL, C MICHAEL
1605 HIGHLAND AVE
KNOXVILLE TN 37916

TANNER, JAMES T
ZOOLOGY DEPT
UNIV OF TENN
KNOXVILLE TN 37916

TAYLOR, THOMAS D
CLEMSON UNIV
P O BOX 2674
CLEMSON SC 29631

TESKA, WILLIAM R
DEPT OF ZOOLOGY
FURMAN UNIV
GREENVILLE SC 29613

THOMAS, R DALE
BIOLOGY DEPT
NORTHEAST LA UNIV
MONROE LA 71209

THOMPSON, RALPH L
112 HOND
FERA KY 40403

TIETJEN, WILLIAM L
BIOLOGY DEPT
GA SOUTHWESTERN CLG
AMERICUS GA 31709

STARLING, JAMES H
207 PAXTON RD
LEXINGTON VA 24450

STASZAK, DAVID J
DEAN OF GRAD STUDIES
UNIV WISCONSIN-STEVENS POINT
STEVENS POINT WI 54481

STERN, WILLIAM L
BOTANY DEPT
UNIV OF FLORIDA
GAINESVILLE FL 32611

STOKES, BETTYE R
P O BOX 189
NEESES SC 29107

STOUT, JUDY P
DAUPHIN ISLAND SEA LAB
BOX 386
DAUPHIN ISLAND AL 36528

STUART, JEANNE
BIOLOGY DEPT
UNIV S CAROLINA SPARTANBURG
SPARTANBURG SC 29303

STUTTS, JOHN R
BOTANY DEPT
UNIV OF GEORGIA
ATHENS GA 30602

SULLIVAN, JOSEPH H
BIOLOGY DEPT
ERSKINE COLLEGE
DUE WEST SC 29639

SUTTKUS, ROYAL D
MUSEUM OF NAT HIST
TULANE UNIV
BELLE CHASSE LA 70037

SWOFFORD, DAVID L
DEPT GENETICS DEVELOPMENT
UNIV OF ILLINOIS
URBANA IL 61801

TARLTON, E LYNN
217 1/2 DUNCAN STREET
RALEIGH NC 27608

TAYLOR, W CARL
710 EAST MARSHALL AVE
OAK CREEK WI 53134

THOMAS, GRACE J
ZOOLOGY DEPT
UNIV OF GEORGIA
ATHENS GA 30602

THOMPSON, BRUCE A
4027 FLEET DR
BATON ROUGE LA 70809

THREADGILL, PAUL F
DEPT PL SCI UNIV OF ONTARIO
LONDON ONT
CANADA N6A5B7 00000

TIMMONS, TOM J
SWINGLE HALL
AUBURN UNIV
AUBURN AL 36830

TIPTON, SAMUEL R 113 W 23RD ST LONG BEACH SOUTHPORT NC 28461	TOLBERT, VIRGINIA R ORNL P O BOX X BLOG 1505 OAK RIDGE TN 37830	TOLLEY, STEPHEN G 323 WOODLAND DRIVE HUNTINGTON WV 25705
TOMAN, FRANK R BIOLOGY DEPT WESTERN KY UNIV COWLING GREEN KY 42101	TOMES, AVERETT S BIOLOGY DEPT GEORGE MASON UNIV FAIRFAX VA 22030	TORRES, MICHAEL A BIOLOGY DEPT ST ANDREWS COLLEGE LAURINBURG NC 28352
TRAVIS, JAMES C DEPT OF BIOLOGY UNC CHARLOTTE CHARLOTTE NC 28134	TRELAHNEY, GILBERT S BIOLOGY DEPT JAMES MADISON UNIV HARRISONBURG VA 22807	TRIPP, GILBERT A JR SCIENCE DEPT CHOWAN COLLEGE MURFREESBORO NC 27855
TROYER, JAMES R BOTANY DEPT NC ST UNIV RALEIGH NC 27607	TRUMBORE, ROGER H BIOLOGY DEPT UNC CHARLOTTE CHARLOTTE NC 28223	TRYBA, SUE ELLEN BOTANY DEPT SOUTHERN ILLINOIS UNIV CARBONDALE IL 62901
TURNER, BARBARA BOX 1818 MISSISSIPPI ST MS 39762	TURNER, HUGH M BIOLOGY MC NEESE STATE UNIV LAKE CHARLES LA 70609	TUTTLE, REBECCA R 79 FAIRVIEW PLACE DECATUR IL 62522
TYLER, WILLIAM A III BIOLOGICAL SCIENCES UNIV OF SOUTH ALABAMA MOBILE AL 36688	ULRICH, SHERI A 11639 7TH LN N APT #4 ST PETERSBURG FL 33702	URBATSCH, LOWELL E BOTANY DEPT LSU BATON ROUGE LA 70803
UTTER, PAULA S RT 2 BOX 373 MONTICELLO AL 36066	VAN DYCK, CAROLYN S P O BOX 828 CHESTER VA 23831	VAN DYKE, C GERALD BOTANY DEPT NC STATE UNIV RALEIGH NC 27650
VAN HORN, GENE S BIOLOGY DEPT UNIV OF TN CHATTANOOGA TN 37401	VANDIVIERE, H W CLG OF MED-COMMUN MED UNIV OF KENTUCKY LEXINGTON KY 40506	VARNEY, DAN R 235 MOORE BLDG EASTERN KY UNIV RICHMOND KY 40475
VIDRINE, MALCOLM F 313 DAVIS ST JENNINGS LA 70546	VINCENT, KARL A BIOLOGY DEPT UNIV OF SOUTHWESTERN LOUISIANA LAFAYETTE LA 70504	VOIGT, C A 224 CHELSEA DR DECATUR GA 30030
VOLPE, E PETER BIOLOGY TULANE UNIV NEW ORLEANS LA 70118	VREDEVELD, GENE BIOLOGY DEPT UNIV OF TN AT CHATT CHATTANOOGA TN 37401	WAUGHAM, SHERRI ANN ZOOLOGY COOP WILD RES LAB SOUTHERN ILL UNIV CARBONDALE IL 62901
WAGNER, ANNE M 4434 GORMAN DR LYNCHBURG VA 24503	WAGNER, C KENYON BIOL PROGRAM CLEMSON UNIV CLEMSON SC 29631	WAGNER-MERNER, DIANE BIOLOGY DEPT U OF S FLORIDA TAMPA FL 33620
WAHLQUIST, HAROLD 756 MARTIN ROAD STONE MOUNTAIN GA 30086	WAHLQUIST, SUSANNE S 756 MARTIN RD STONE MOUNTAIN GA 30086	WAIDE, JACK B 110 NEWRIDGE RD OAK RIDGE TN 37830
WAINBERG, ROBERT H ZOOLOGY DEPT THE UNIVERSITY OF TENNESSEE KNOXVILLE TN 37916	WAINRIGHT, SAM C DEPT BIOC SCI FLORIDA ATLANTIC UNIV EGG HATON FL 33432	WAITS, F DOUGLAS 1257 GREENSFORD RD BIRMINGHAM AL 35208
WALDOFF, GRAY W PENSACOLA JR CLG PENSACOLA FL 32504	WALKER, CYNTHIA P 3136 W HENRY TAMPA FL 33614	WALKER, H J JR MARINE ECOLOGICAL CONSERV 533 STEVENS AVE SOLANA BEACH CA 92075
WALKER, KIPPY H 406 PEBBLEBROOK DR SEABROOK TX 77586	WALKER, WILLIAM H JR BIOLOGY GA INSTITUTE TECH ATLANTA GA 30322	WALL, ESTHER C 445 CHURCH STREET MOLKSVILLE NC 27028
WALL, WENDELL E UNIV ALA IN BIRMINGHAM BIRMINGHAM AL 35294	WALLACE, GLENN A BOTANY DEPT CLEMSON UNIV CLEMSON SC 29631	WALLACE, H W APT 20 SYCAMORE 1717 NW 23RD AVE GAINESVILLE FL 32605

WALLACE, JAMES W
IOLOGY DEPT
WESTERN CAROLINA UNIV
CULLOWHEE NC 28727

WALTER, ROHN A
P O BOX 33- LG
MELBOURNE FL 32935

WARD, JOHN F JR
IOLOGY DEPT
HIGH POINT CLG
HIGH POINT NC 27262

WARE, STEWART A
IOLOGY DEPT
WILLIAM AND MARY CLG
WILLIAMSBURG VA 23165

WARREN, MELVIN L JR
NY NAT PRESERVES COMM
407 HROADWAY
FRANKFORT KY 40601

WATKINS, WILLIAM D
RESEARCH AND DEVELOPMENT
ASHLAND PETROLEUM CO
CATLETTSBURG KY 41149

WFAVER, GEORGE T
RT 1
ANNA IL 62906

WEDER, RICHARD Y
4020 WINGATE DRIVE
RALEIGH NC 27609

WELDEN, ARTHUR L
IOLOGY DEPT
TULANE UNIV
NEW ORLEANS LA 70112

WENTWORTH, THOMAS R
BOX 5186-DEPTANY
NC STATE UNIV
RALEIGH NC 27650

WEST, K ANDREW
CONSERVTN-NATURAL AREAS
PO BOX D
BENTON IL 62812

WESTMORELAND, GAIL
BOTANY DEPT
SOUTHERN ILL UNIV
CARBONDALE IL 62901

WHEDBEE, ELMER D
IOLOGY DEPT
EAST CAROLINA UNIV
GREENVILLE NC 27834

WHITAKER, JAMES D
IOLOGY DEPT
VPI AND SU
BLACKSBURG VA 24061

WHITE, JUDSON W
RT 2 BOX 206-E
HUMPHASS VA 23024

WHITFORD, L A
BOX 5185
ST UNIV STATION
RALEIGH NC 27507

WALLACE, RICHARD K
315 TULLAHOMA
AUBURN AL 36830

WALTON, LUCILLE
1116 RICHMOND PLVD
DANVILLE VA 24541

WARD, ROBERT P
216 CANTRELL AVE
NASHVILLE TN 37205

WARMONOD, DAN H
HILLCREST FARM
EELVIDERE TN 37306

WASCOM, EARL RAY
P O BOX 461
UNIVERSITY STATION
HAMMOND LA 70402

WATSON, FRANCIS
BOTANY DEPT
NCSU
KALLIGH NC 27607

WEBB, DAVID H
2013 COVINGTON ST
FLORENCE AL 36830

WEEKS, LEO
IOLOGY DEPT
HIGH PT CLG
HIGH POINT NC 27262

WELLS, ELIZABETH F
DEPT BIOL SCIENCES
THE GEORGE WASHINGTON UNIV
WASHINGTON DC 20052

WERTH, CHARLES R
BOTANY DEPT
MIAMI UNIV
OXFORD OH 45056

WEST, WARWICK R JR
BIOLOGY DEPT
UNIV OF RICHMOND
RICHMOND VA 23173

WHARTON, CHARLES H
DEPT OF BIOLOGY
GEORGIA STATE COLLEGE
ATLANTA GA 30303

WHIGHAM, DENNIS F
BOX 28
CHESAPEAKE BAY CNTR ENVIRONM
EDGEWATER MD 21037

WHITE, ALAN G C
BIOLOGY DEPT
VA MILITARY INST
LEXINGTON VA 24450

WHITE, LINDA S
RT 4 BOX 448
JONESBORO IN 37659

WHITING, PHINEAS W
326 HAWTHORNE RD
BALTIMORE MD 21210

WALNE, PATRICIA L
BOTANY DEPT
UNIV OF TENN
KNOXVILLE TN 37916

WARD, H BAILEY
BIOLOGY
UNIV OF MISS
OXFORD MS 38677

WARF, DONNA M E
BIOL DEPT-HERRARIUM
WILLIAM AND MARY CLG
WILLIAMSBURG VA 23185

WARNHOFF, EDWARD H JR
P O BOX 152
LOUISIANA COLLEGE
PINEVILLE LA 71360

WASS, HARVIN L
VA INST OF MARINE SC
GLoucester PT VA 23062

WEATHERSBY, SCOTT M
1502 COLLEGE HILL
RUSTON LA 71270

WEBB, KENNETH L
VA INST OF MARINE SCI
GLoucester PT VA 23062

WEISS, T EDWARD JR
DEPT OF BIOLOGY AND ENV SCI
CHRISTOPHER NEWPORT CLG
NEWPORT NEWS VA 23606

WELLS, MARION H
MTSU
BOX 252
MURFREESBORO TN 37130

WEST, JERRY
RT 47
CULLOWHEE NC 28723

WESTFALL, JONATHAN J
BOTANY DEPT
UNIV OF GA
ATHENS GA 30601

WHEAT, BRUCE
COASTAL PLAIN EXP STA
TIFTON GA 31794

WHIPPLE, STEPHEN A
BOTANY DEPT
LSU
BATON ROUGE LA 70803

WHITE, JESSIE S
116 W SUNFLOWER RD
CLEVELAND MS 38732

WHITE, PETER S
UPLANDS FIELD RES LAB
GREAT SMOKY MTS NAT PARK
GATLINBURG TN 37738

WHITNEY, KENNETH D
BOTANY
UNIV OF NORTH CAROLINA
CHAPEL HILL NC 27514

WHITSON, MONA M 1036 JEAN AVE TALLAHASSEE FL 32303	WHITTIER, DEAN P SUBSTA B-BIOLOGY VANDERBILT UNIV NASHVILLE TN 37235	WHITTINGHILL MAURICE ZOOLOGY DEPT 045A UNIV OF NC CHAPEL HILL NC 27514
WICKLAND, DIANE E SAVANNAH RIVER FCOL LAB DRAWER E AIKEN SC 29501	WICKSTROM, CONRAD E BIOLOGY EMORY UNIV ATLANTA GA 30322	WICKSTROM, GLENDA C BIOLOGY DEPT EMORY UNIV ATLANTA GA 30322
WIERSEMA, JOHN H 1436 21ST AVE E TUSCALOOSA AL 35401	WILEY, DORA F PO BOX 893 MONCKS CORNER SC 29461	WILKINSON, FVELYN DEPT OF BIOLOGY, GILMER HALL UNIV OF VIRGINIA CHARLOTTESVILLE VA 22901
WILLARD, WILLIAM K IOLOGY DEPT TENN TECH UNIV COOKEVILLE TN 38501	WILLIAMS, ANN HOUSTON ZOOLOGY-ENTOMOLOGY DEPT AUBURN UNIVERSITY AUBURN AL 36830	WILLIAMS, ARTHUR L SCHOOL OF BIOLOGICAL SCI UNIV OF KENTUCKY LEXINGTON KY 40506
WILLIAMS, CAROL S IOLOGY DEPT TUSKEGEE INSTITUTE TUSKEGEE INST AL 36268	WILLIAMS, JAMES D US FISH AND WILDL SER OFFICE ENDANGERED SPEC WASHINGTON DC 20240	WILLIAMS, JEFFREY T ZOO DEPT 223 HARTMAN HALL UNIVERSITY OF FLORIDA GAINESVILLE FL 32611
WILLIAMS, JOHN S IOLOGY DEPT BOX 1927 UNIVERSITY AL 35486	WILLIAMS, LOUIS G BIOLOGY DEPT PO BOX 1927 UNIVERSITY AL 35486	WILLIAMS, THEODORE C P O BOX 13387 ETSU JOHNSON CITY TN 37614
WILLIAMSON, E BRUCE IOLOGY DEPT UNIV OF SOUTH FLORIDA TAMPA FL 33620	WILLIS, LLOYD L II RT 3 BOX 842 CROZET VA 22932	WILLS, WIRTH DEPT PL PATH AND PHYSIOL VPI AND SU BLACKSBURG VA 24061
WILSON, CAROL PAIGE DEPT ANATOMY CLG MEDICINE ETSU JOHNSON CITY TN 37601	WILSON CHARLES R P O BOX 1890 WILMINGTON NC 28402	WILSON, ELIZABETH J HAXTON MARINER'S MUSEUM NC MUSEUM NAT HISTORY BEAUFORT NC 28516
WILSON, JAMES L 2500 WOODBERRY DR NASHVILLE TN 37214	WILTSHIRE, GRACE T 201 WOODLAND AVE LYNCHBURG VA 24503	WINDLER, DONALD R BIOLOGY DEPT TOWSON ST CLG BALTIMORE MD 21204
WINGFIELD, E BURNELL DEPT BIOLOGY VIRGINIA MIL INST LEXINGTON VA 24450	WINSTEAD, JOE E BIOLOGY DEPT WESTERN KY UNIV BOWLING GREEN KY 42101	WISER, C WYMER BIOLOGY DEPT MIDDLE TENN ST UNIV MURFREESBORO TN 37130
WISTRAND, HARRY BIOLOGY DEPT AGNES SCOTT COLLGE DECATUR GA 30030	WITHERSPOON, JOHN JR HEALTH AND SAFETY RES OAK RIDGE NATL LAB OAK RIDGE TN 37830	WOFFORD, R EUGENE BOTANY DEPT UNIV OF TENN KNOXVILLE TN 37916
WOLF, FRED T BIOLOGY DEPT VANDERBILT UNIV NASHVILLE TN 37235	WOLFSON, ALFRED M 310 N 14TH ST MURRAY KY 42071	WOOD, ANNE MICHELLE ECOLGY UNIV OF GEORGIA ATHENS GA 30602
WOOD, CARROLL E JR HARVARD UNIV HERBARIUM 22 DIVINITY AVE CAMBRIDGE MA 02138	WOOLCOTT, WM S JR BIOLOGY DEPT UNIV OF RICHMOND RICHMOND VA 23173	WOUTEN, MARIE W 1104 Neff ST LENTON TX 76201
WORKMAN, SARAH W SAVANNAH RIVER ECOLOGY LAB DRAWER E AIKEN SC 29801	WUNDERLIN, RICHARD P DEPT OF BIOLOGY UNIV OF SOUTH FLORIDA TAMPA FL 33620	WYATT, JIMMY T USAFAM EDGEWOOD ARSENAL APG MD 21010
WYGODA, MARK L DEPT ZOOLOGY UNIV OF FLORIDA GAINESVILLE FL 32611	WYNN, GAIL G 115 EAST 52ND ST SAVANNAH GA 31405	YAKPROUGH, JOHN A BIOLOGY DEPT MEREDITH CLG RALEIGH NC 27611
YEANY, RUSSEL W SCIENCE, EDUCATION DEPT UNIVERSITY OF GEORGIA ATHENS GA 30602	YEPGER, RALPH W BIOLOGICAL SCIENCES FL ST UNIV TALLAHASSEE FL 32306	YOCLEY, PAUL JR BIOLOGY DEPT NORTH ALABAMA UNIV FLORVILLE AL 35630

YOUNG, WILLIAM W JR
TOLOGY DEPT
VPI AND SU
BLACKSBURG VA 24061

YOUNG, RICHARD C
FISH AND AQUATIC ECOL BRANCH
TVA EDB
MUSCLE SHOALS AL 35660

1333
ZATTAU, WILLIAM L 51 01 151
BOTANY DEPT
CLEMSON UNIV
CLEMSON SC 29631

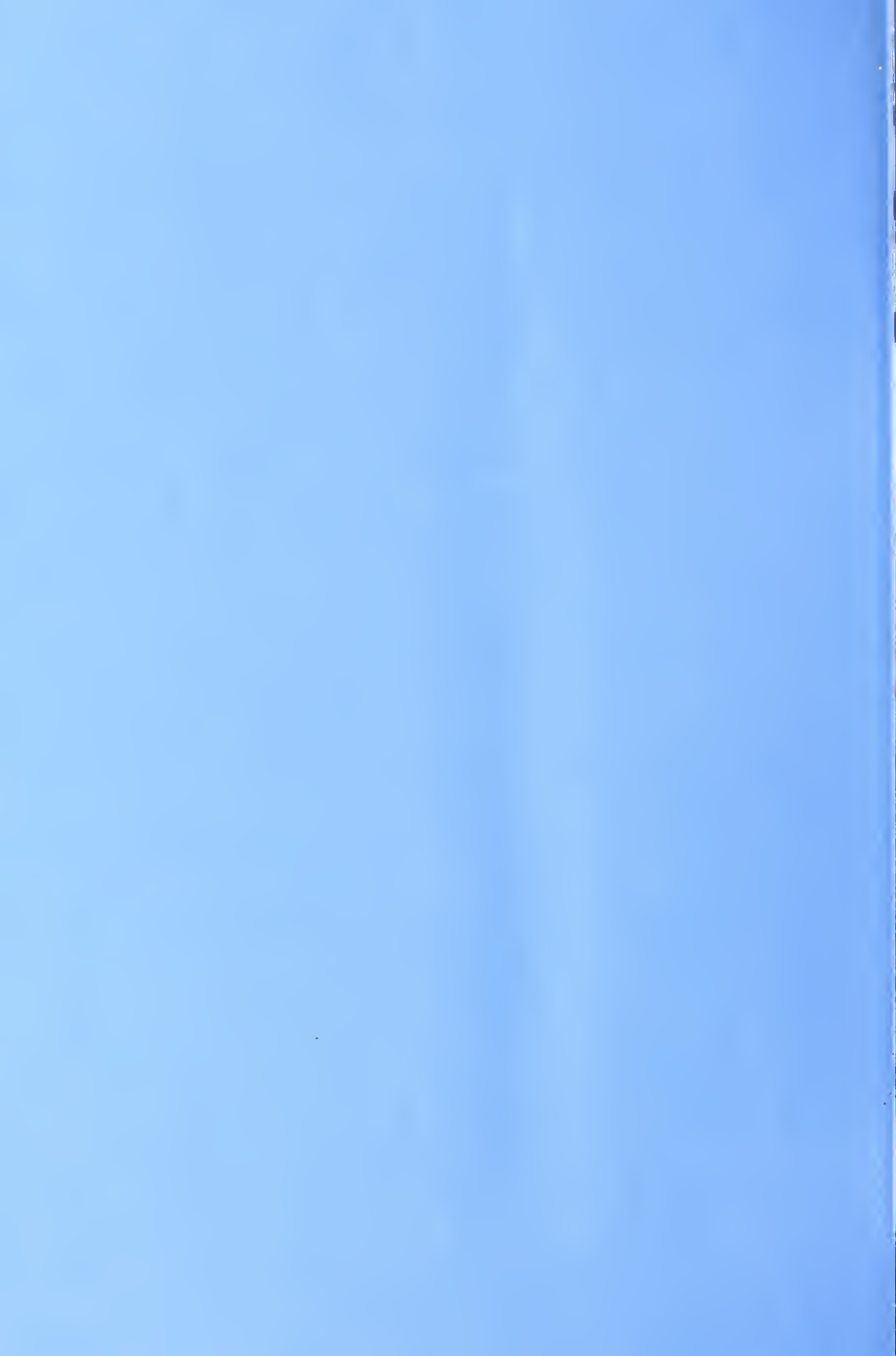
YOUNG, MARTIN D
BOX J-13A MILLER HLTH
U FLA-CLG VET MEDICINE
GAINESVILLE FL 32610

YOUNG, R W
224 CARDINAL LAJE
MONTGOMERY AL 36109

YOUNG, M LOUISE
BOTANY DEPT
SOUTHERN ILL UNIV
CARBONDALE IL 62901

ZAGER, RONALD D
6147 CHERRY HILL DR
COLUMBUS OH 43213





59.06
The ASB

QH301
.A78
*

BULLETIN

Volume 29, Number 1

January 1982

JAN 29 1982

A. M. N. H.



Perkins Building, Eastern Kentucky University

***The Official Quarterly Publication of
The Association of Southeastern Biologists***

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Past President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

President Elect — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Vice-President — Donald J. Shure, Biology, Emory University, Atlanta, GA 30322

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Sewanee, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059

Sharon Patton (1984), Veterinary Pathobiology, University of Tennessee, Knoxville, TN 37916

AAAS Representative, Section G —

Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

Walton Distinguished Lecture Series—2	3
Featured Research Program	13
Association Affairs	16
News of Biology in the Southeast	23
Mt. Lake Biological Station Announcement	26

COVER

The Carl D. Perkins Building Conference Center at the southern end of the campus of Eastern Kentucky University, Richmond, Kentucky; site of the 43rd Annual Meeting of the Association of Southeastern Biologists, April 14–17, 1982.

TIME AND PLACE OF FUTURE MEETINGS

1982	April 14–17	Eastern Kentucky University, Richmond
1983	April 13–16	University of Southwestern Louisiana, Lafayette
1984	April	Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Company, Greenville, SC



Walton Distinguished Lecture

Series—2

The Carthaginian Lesson: An Ecological Model of the Causes of the Great Wars

by
Paul Colinvaux

The Ohio State University

Two thousand, one hundred and ninety years ago a desperate war was being fought between Rome and Carthage. Hannibal had crossed the Alps with his elephants and was maintaining himself in the Italian countryside; and a series of Roman armies sent against him were going down to defeat so remarkable that our history books still thrill at the memory. Yet Hannibal was to fail and his cause be lost. The wars between Rome and Carthage were at once ferocious, epic, and annihilating. Competing states met and one was excluded.

Clear clashes between populations like those of Rome and Carthage are events which can be studied by ecologists no less than by historians. It is the thesis of this essay that what happened in those wars can be understood from modern knowledge of what makes human and animal populations behave the way they do. And in explaining why Carthage had to fight, and why Rome prevailed, an ecological approach to the causes of war turns the Carthaginian fate into a lesson for the understanding of other wars. The next great war will be something like it.

The Carthaginian lesson was made up of

three wars; Punic wars as the Roman authors called them. The first was a long war of attrition over the ownership of colonial lands. In the second war Hannibal crossed the Alps with his elephants, and the third war ended with one of the most brutal defeats of which we have record, when the city of Carthage was torn to pieces and salt scattered in the ruins so that its few survivors should abandon all hope of posterity.

Roman authors, and our school books, tell the tale of these wars as a struggle to see which state should be mistress of the world; Rome, with all Italy already in its power, or the trading city of Carthage, sweeping the Mediterranean Sea with merchants and fleets. Rome did indeed go on to conquer and enslave every nation within reach of its terrible legions. But the war was not over who should be "mistress." It was a struggle for raw survival by the civilized folk of a trading state against the resources and weapons of a continental power. I suggest that the good guys lost.

The approach to war proper to the thinking of a professor of ecology is to look to what is in dispute: resources needed, ambitions for ways of life, the real choices for

populations. We ecologists think we understand expanding populations or struggles for resource. Similar events in animal species are the substance of our trade. The Carthaginian wars, like all the other wars that really mattered, came about because populations of the people-animal responded in the unique people-way to pressures described by ecological laws.

We need to grasp only two fundamental principles of modern ecology to understand the wars that have happened, and the wars that will happen next: the principles of *breeding strategy* and *niche*. By *breeding strategy* we mean the particular way that each species is programmed to thrust the largest possible number of offspring into the next generation. By *niche* we mean the particular way of life that a species follows to win resources from its surroundings and turn those resources into babies.

When a salmon lays a thousand eggs there may, in pure theory, be a chance to multiply its numbers a thousand fold. In practice the eggs and hatchlings are so tiny as to be almost helpless. Nearly all of them die very quickly, and the salmon's breeding strategy is a gambler's strategy likely to yield the sorts of returns known to those who bet on horse races: it consumes capital rapidly, though it sometimes pays off. Bank managers do not approve of "investing" in horse races, and they will not approve a salmon's breeding strategy when it is explained to them. But bank managers will approve the breeding strategy with which people have been equipped in their evolutionary past.

People make large babies, and they protect and feed those babies until they are ready to go out and start families of their own. What our kind is really doing with this breeding strategy is to count out the available capital of resources that can be set aside for the breeding effort, and to parcel this capital out in those few enterprises (children) that we reckon safely to bring to fruition.

We do not gamble, we bank. Salmon and

people are at opposite ends of a continuum of possible breeding strategies; scattering resources in numerous tiny gambles at one end and banking heavy investments in a few near-certainties at the other. This is a theme that I have taken up in more detail in my book *WHY BIG FIERCE ANIMALS ARE RARE*.¹ To understand the fate of Carthage it is necessary to realize that the human breeding strategy is not a strategy of restraint but a strategy of fitting the breeding effort to the resources available. We invest wisely in our babies.

The human breeding strategy, then, is for each couple to select the number of offspring it can afford to rear in the circumstances of its times, and then to ply these babies with resources until they are ready to breed themselves. When we are winning the necessary resources we are carrying on life in our *niche*. Simple analogy of people with robins will illustrate this point.

The *niche* of a robin is everything robins do to win a livelihood. They must be good at pulling up worms, at turning leaves with that sideways bounce of the head we see them at under the trees; they must have the proper diligence and accuracy in the hunt for green caterpillars. But they must also be good at dodging hawks and cats, being alert, quick of eye, learned in the alarm notes of other birds that will tell them to be wary. They must recognize their own kind, and the difference in the sexes. They must be programmed for that incredible return journey of a thousand miles, flown every autumn and every spring. All these things and many more constitute the niche of robbing. It is a highly skilled trade, a professional job, definitely not for amateurs. And so an ecologist sees a robin as the embodiment of a way of life, a profession, its *niche*.

Every robin couple carries on life in this exclusive trade we call the robin niche and, each year, it rations out the resources won between a handful of baby robins. The robin breeding strategy is very like ours, banking on the few sound enterprises rather than

gambling on scattered chips of many tiny eggs. Robins thus reveal very nicely the essential part of our breeding strategy and one that has been responsible for much of the pace of history.

It is necessary for robins to get the number of babies in each robin family exactly right. One baby too few and other families of robins will outbreed you down the years, forcing your line into hereditary oblivion. But one baby attempted too many and your whole brood may be in jeopardy when there is not enough food to go round. Banks have to gauge their projects accurately and not spread their resources too thinly or disaster results. In robins this requirement appears to be met by an egg-laying response to the food supply, presumably working through the fatness of the mother. We have good evidence in birds like robins that the number of young in a nest is a function of the food locally available.²

But now for the vital implications of the concepts of niche and breeding strategy for the student of human history. The numbers of any animal that can live are set by the niche, not by the breeding strategy. Indeed, the numbers alive are not usually affected by the breeding strategy at all. I find that this idea is often startling to non ecologists, so let me pursue it a little further, both with robins and humans.

Every robin couple is doomed to trying to outbreed every other robin couple. The prizes in the race between robin families are niche-spaces in the next generation and the decision made by the natural judge of the race (whom we call "natural selection") is whose babies will live to take up the limited number of robin jobs available. This is because the number of robin jobs is fixed, fixed as certainly as the jobs of any human trade in a stagnant society. The numbers of robins are set by the robin niche and this number cannot be stretched by any process of breeding. So the breeding effort has no lasting effect on the numbers of robins that live and robins are roughly equally common every spring.

The niche of a robin may be likened to the job of professing. There can only be as many professors in any society as there are professorships available. If we reproduce (train) more potential professors by boosting the enrollment of our graduate schools, the surplus cannot get jobs as professors. Surplus robins die; surplus professors must turn to honest work to get a living.

We approach the fates of the peoples of Carthage and Rome once more when we reflect that a prime difference between modern people and all other animals lies in this matter of being able to change jobs. Surplus robins can never find another trade, surplus people do it all the time. We are an animal that has learned to change its niche at will. But we have certainly never learned to change our breeding strategy, which is still like that of robins or our stone age ancestors who lived, like the robins, in a fixed niche. Every couple continues to raise the number of children it thinks it can afford. Rich couples sometimes have fewer children than poor couples because they have learned to put more resources into each child if it is to be brought up in the prevailing niche, but the underlying strategy has not changed.³

Carthage was a city of wealthy, civilized folk who lived by their brains and by trade. The city had the sea on one side and the desert on the other. It was effectively an island state with no room to expand. We know from the Roman writers that the people had made the most of what they had got, terracing their hillsides, irrigating so that their buildings stood out against a marvel of cool green.⁴ They were engaged in the technological fix of a contemporary green revolution.

The niches of people in the various levels of Carthaginian society were mostly ones which we ourselves would recognize and with which we would feel comfortable. It was a republic of sorts in which they lived, supporting senators, lawyers, artists, physicians, writers, merchants, priests, agricultural experts, engineers, soldiers, bu-

reaucrats, and school-teachers. For each of these professions or niches there could be only so many jobs in an island constrained by sand and sea. The state might feed more people (up to a point) by developing the utmost agricultural potential of what they had, and this they did. Slaves and peasants could be packed into the tiny territory of the state by this means.

But the niche-spaces of professors, artists, engineers, and the rest cannot be increased by a green revolution. Furthermore, an admirable civilized community always wants to increase the standard of living, not to compress it. In ecological parlance the Carthaginians would want even larger niches for each individual.

Yet living was good in such a state and individuals of all ranks could be expected to plan families accordingly. Children could certainly be fed in a country committed to a form of green revolution. The poor could raise large families. The rich might have fewer children, but, even if they did, each couple would still plan for more than would replace their parents on the average, just as it has been in all later civilizations. We have no censuses of Carthaginian people, but it is a safe prediction that there were steadily ever more of them. The breeding strategy under which our species operates makes this certain.

We know what the rulers and the clever ones in Carthage did to find more living for themselves and their people. Beyond technological expertise in agriculture, they did the only possible things; go trading and establish colonies.

Trade increases the niche-space of an island state in at least three ways. It does the obvious in bringing in food and raw materials from other people's lands, but more important are the jobs it creates at home in the making of articles for trade. Trade creates more niches in manufacturing, rather as if a robin could teach some of its surplus offspring to take on the activities of crows. And possibly even more important still, the practice of trade gives broad, in-

teresting lives to the traders themselves, to those who journey in the ships.

The Carthaginians came to live, not just on their piece of real estate between the desert and the sea but on the hinterlands served by dozens of ports all round the Mediterranean. They lived rather as the people of Manhattan Island live now, going on journeys to distant suppliers, regulating the affairs of far-away commerce, importing raw materials, exporting the elaborate products of their skills. But there was no Union of States to hold Carthage to those on whom she depended for life, only a tenuous system of alliances.

Establishing a colony is a more drastic solution to the niche-space or jobs problem than is trade. A true colony is an over-flow portion of the parent state; a settlement of exported people, claiming their broader niches in other people's lands. True colonies are not what contemporary Marxists abuse with their term "colonialist-oppressors." There is almost total expropriation and distress to be endured by the inhabitants of a country chosen by civilized people as the site for one of their colonies. This can be understood by reflecting on the fate of the American Indians when the civilized and ambitious people of England chose America for colonies.

Carthage, itself once a colony of Tyre, put down many colonies, and used these not only to deposit people but also as the bases for further trade. And, as in all colonialist enterprises, Carthage needed some skills in the soldierly arts. She developed an army on civilized lines, which is to say she armored her men against the weapons of barbarians, and gave them a modicum of discipline. Essentially she developed the same shield-wall technology of fighting we think of for Greek armies, the technology of the armored spearman.

Carthaginian soldiers wore steel over as much of their bodies as they could afford; greaves, breastplate, helmet. They would huddle close together as the Greek heavy infantry did, each man protected by the

shield of his neighbor, so that the enemy faced an almost unbroken line of steel-bossed leather and wood, waiting, or clanking forward with the rhythmic clunk of discipline. And projecting from this phalanx of armor were thrusting spears, ready to impale, the civilized method of killing at a distance.

Armies on the Carthaginian model were typical of the ancient Mediterranean. They were very effective for the prime soldierly business of the day, which was the expropriation of land from less civilized folk in the interests of both colonies and trade. Barbarians, the iron-age countrymen of those times, must have been nearly as helpless against these walls of steel and spears as were the Amerind barbarians of America against European weapons. Things were different, however, when one city brought its armies against another city. Then the technology of war had to be improved. But trading Carthage with the desert at its back had less need for fighting civilized equals than, say, a Greek city or, and this was to be her undoing, an Italian city. That Carthage neglected her army we can infer from the fact that she employed mercenary troops to do much of her fighting.

Yet there came a day when Carthage aspired to more ecological resource for her people than could be met from trade and coastal colonies at the end of sea lanes. We can predict that she would one day need this from what we know of the human breeding strategy and ambitions for a broader niche. And we know that she tried for these resources by starting the conquest of her nearest neighbor, the island of Sicily. When in Sicily, the mercenary Carthaginian shield-walls met armies sent out from Italy by the governing city of Rome bent on the same mission of acquiring resources for expanding ambitions. And these Roman armies were the technical masters of the shield-wall system of fighting.

Rome had followed the pattern of expansion, trade, and colonies also, but in the context of an inhabitable, continental mass.

The way up for Rome had involved endless fights with armies of civilized neighbors. Roman citizens did their own fighting. Learning to war was one of the prime duties of a Roman male and the Romans set aside the fields round their city, the *campus martius*, for life-long training in war. It is curious that we name the peaceful land of a university, the campus, after the place where Romans learned to fight. Yet it was on this original campus that Rome invented a new technology of warfare which should sweep into permanent oblivion the shield-wall armies of the Greeks, Carthaginians, and the rest. We know this technology by the name of Roman Legion.⁵

The Roman Legion met the tank of the shield-wall with techniques of maneuverability and fire-power. You can get the essence of the trick by thinking of the traditional picture of the Roman soldier; a man with a very large, oblong shield and a short, straight sword. The shield was big enough that he did not need to huddle up to his neighbor. The little short sword was for dispatching the wounded, and for butchery when once he and his mates got into the lines of a shattered enemy formation. What he actually fought with were missiles; the javelins and darts (the die is cast) of which latin writers talk so much. Legions did not attack shield-walls, they tore them down from a distance where their men were safe from the thrusting spears.

Picture yourself in a Carthaginian formation as a legion bears down on you. You huddle in your armor, your spear thrust forward, waiting. A loose but disciplined array comes swiftly at you. It looks solid from the front but a bird's-eye view would show that the men are arranged like the squares on a checkerboard. At 25 paces the front line stops, there is a shout of command, a swirl in the ranks and a flight of heavy javelins thuds into you, wounding, impaling, clamping as immovable deadweights to the fronts of shields. Another swirl and another flight. The ranks of the checkerboard shuffle and a fresh line of throwers faces you.

They shuffle again, and more flights of javelins thud home. There are hurt men all around you; gaps in your ranks to be closed; and you have not struck a single blow. Soon your line will be so torn that these nimble foemen will run among you, stabbing with those short swords. In desperation your officer orders the charge and you lumber forward, clanking in your heavy armor, your arms tired with the weight of a javelin or two dragging down your shield. But the checkerboard in front of you shuffles again and melts to the rear. And there, closing the gaps through which they have let their comrades of javelin and dart-men pass, stand the men of a Roman shield-wall like your own; heavily armored, shoulder to shoulder, spears waiting for your wounded ranks, the back-up line of the legion.

The ancient world found no technical answer to the legion, probably because its prime secret lay in a lifetime of training. It was the discipline of the missile men that made them formidable. They came out of a campus and conquered a world. It was soldiers like these that the Carthaginian colonists and expropriators met in Sicily. Expanding states were quarrelling over a big bone they both thought they needed, but one of them had great technical superiority in the methods of war.

The war that Rome and Carthage fought over Sicily lasted twenty-two years.⁶ It was a grinding war of attrition. Carthaginian armies were beaten repeatedly, though her cause on land was kept alive by feats of superior generalship that sometimes made up for the technical inferiority of her soldiers. But Carthage kept the war going because her fleets held the seas round Sicily. When at last the Romans won a sea-fight too, the Carthaginians sued for peace, ceding all Sicily, together with other lands the Romans wanted. The stage was being set for Hannibal and the final horror.

I remember a schoolmaster telling me long ago that the Carthaginians lost because they were quitters; that they had not been

properly beaten in war at all, that they still had armies and fleets, that, in short, they had not the resolution of their Roman conquerors. But now that I am a professor of ecology I see things differently.

As a trading state Carthage fought her war partly from savings. She was rich with the accumulated capital of trade, but her income was dependent on fragile sea lanes. She even had to pay her mercenary soldiers, not from the revenues of land she held, but from the revenues of trade. The adventure in Sicily was the first real attempt to put right this precarious state of affairs. But until she had secured this base of a productive land mass the aspirations of her rising numbers depended entirely on sea-born traffic. To lose a fight at sea, a fleet even, or to watch the sea lanes threatened was indeed desperate. The Romans, on the other hand, fought their war from the income of a conquered continental mass. They may actually have got richer during the war, even while the Carthaginian merchants were losing their shirts.

But, in admitting defeat in that first Punic war, Carthage was in a position that must have been grievous. Let us suppose that Carthage had, indeed, sent her soldiers to take Sicily for the reasons a professor of ecology suggests, to seek more niche-space for increasing numbers of ambitious people; then both the desperate state to which she was reduced, the steps she took, and the final events, fall into place. On this ecological analysis, the expedition to Sicily has been conceived out of need. In losing the war this need was still present. But now there were the added needs of having spent capital in the long war, the loss of other lands, the loss of allies, the loss of the fleet, and, final acute difficulty, the problem of what to do with all those mercenary soldiers. This last acute need was the most pressing, because the mercenaries mutinied in the city of Carthage itself, demanding the pay that the city no longer had to give them.

Probably Carthage should have gone under right away, accepting the status of off-

shore island to be incorporated and ruled by Rome. She had neither the resources nor the military technology needed to stand against a continental power possessed of unattainable, state-of-the-art weaponry of war. But the end was delayed because there came to the rescue of Carthage two very remarkable men, Hamilcar Barca and his great son, Hannibal.

Hamilcar finished off the mutiny in the sternest of soldierly ways, then he offered soldier and citizen alike what was a real solution to the Carthaginian needs. He would find room for them in the barbarian lands of far-away Spain. Carthage would find resources for its people, its colonists, and its trade in this western extreme of the Mediterranean as far away from Rome as it would be possible to get. This was a plan both ecologically and militarily sound. England did something like it eighteen hundred years later, when the English turned away from sending armies to France and spent their energies peopling America.

And it was done. Hamilcar appears even to have given good government to barbarian Spain, so conducting himself that there was a minimum of friction and so that, when the next need came, the Carthaginian state could call on Spaniards for loyal service in the armies. But this was to be under Hannibal, who succeeded his father as governor in Spain.

Yet even in Spain the Romans would not leave Carthage alone. By then Rome was sending trading fleets round the Mediterranean, just as Carthage was. Their traders were competing for markets. In the Roman Senate there were cries for protection of trade. Why should Romans be put out of work by the ancient equivalents of Datsuns and Volkswagens, the products of a beaten enemy? Eventually the Romans found an excuse in a local Spanish campaign of Hannibal's, sent an ultimatum which was deliberately meant to be unacceptable, and declared war on Carthage. The aim was the utter destruction of her trade rival. With the legions to call on, it ought to have been

quick and easy. But it was not. Because of Hannibal.

Hannibal gathered an army in Spain and began that epic march along the coast of the Mediterranean Sea, across Gaul and to where the Alps awaited him. This was a march through barbarian country, by an army that had to live off the land, and yet that army did not wither, it grew. These fresh soldiers were to leave their homes, cross the high mountains and descend into the plains of Italy where they would meet the most terrible armies known to their day. It was a leader who could build an army in these circumstances with whom the Romans now had to reckon.

The surviving elephants and men made their way through the mountain passes and the Senate dispatched the legions to deal with them. It was to be legion against shield-wall; interior lines against exterior lines; superior numbers and massive reserves against a small invading army far from home. But then Hannibal began to win battles, against all probability; against appalling odds, he began to win. His most famous battle at Cannae shows the sorts of things he did.

At Cannae, Hannibal posted his men with a river at their back, in a line between two small hills. It was a come-on to the Roman generals, for the Carthaginian army must seem to be in a trap. The legions formed and advanced, the javelins showered, the shield-walls of Carthage gave before such a technically superior assault from superior numbers, as they had to; back towards the river; back in a deep "U" with the legions pressing after them. Then from over the shoulder of each of the flanking hills appeared the rest of Hannibal's men; the best armed and the best; shoulder to shoulder in clanking steel they crunched into the ends of the bending line of the legions. And from miles away came the galloping horses of Hannibal's African cavalry to dash into the Roman rear. The legions disappeared into knots of desperate men, forming circles, fighting on all sides, sword

against thrusting spear. Few of them survived the day.

Cannae was one of the greatest triumphs of the human spirit over technical odds of which we have record. It is still something to do the heart good to think on, so great a triumph of the genius of one man over brutal technical and material superiority. Hannibal did nearly the same thing twice more, and he supported himself in Italy for sixteen years, prowling round the Roman city he was not strong enough to attack, but so fearful a person that Romans could not bring armies against him for years on end.

The same schoolmaster who once told me about the Carthaginians quitting in the first Punic war, mused aloud about what Hannibal thought he was doing in all those years in Italy during the second. But when we know the ecological realities that faced Carthage, it is not hard to see. Hannibal had to set the policy of his island nation when it was attacked by a far more powerful, continental state, possessed of unmatched armies, and demanding that Carthage hand over all that made a happy life possible for her people. What then should be Hannibal's policy and aim?

Hannibal's position was like, but not so simple as, that of Britain's Churchill in 1940. On his first day as Prime Minister, Churchill had said in the House of Commons, "You ask, what is our policy? I will say: It is to wage war" "You ask, what is our aim? I can answer in one word: Victory." In a later speech Churchill showed how this victory would be won when he told of fighting on until "The New World with all its power and might comes to the rescue and succour of the Old." Carthage had no friendly United States; nothing except trade, the colonies in Spain, an army of loyal barbarians not up to the latest technology, and Hannibal's brave spirit. So how would Hannibal have answered Churchill's questions? His policy? Likewise to wage war, for he had no other choice. But his aim! Victory? This surely

was impossible. So what could his aim be? It was the old one of "Let my people go!"

The years in Italy were spent sending the message, "Let my people go or I will hurt you." This was Hannibal's aim: to hurt and stay alive until Rome gave them the right to live in Carthage and Spain, and to support themselves by trade. Hannibal's celebrated messages to the people of Italy clearly support this aim. "My quarrel is not with you, but I come to fight for you and against the city and armies of Rome." These messages spoke the simple truth.

But the Romans always knew their strength and they would not let the Punic peoples of Carthage go. One man's genius could not hold out against technology and odds forever. At last the Romans found themselves a general of Hannibal's own stature, Scipio, whom they afterwards called "Africanus." Scipio drew Hannibal after him to the defense of Carthage itself, in Africa. Then, at the battle of Zama, he made no mistake with the handling of his superior legions and saw that the laws of technical advantage were obeyed, Hannibal or no Hannibal.⁷ The Carthaginian soldiers, and the young men from their town, were killed by the flights of javelins that day, rank by rank, until all of them were dead. And the people of the city threw open their gates and surrendered unconditionally.

General Scipio gave generous peace terms. "Stop building warships, never tame another elephant for war, build no army against us, and we will let you alone to trade peacefully from your city." Of course the peace terms also required that Carthage give up its overseas possessions to Rome.

Probably Scipio really thought that, with the war over, Carthage could quietly live in peace. But then he was a soldier and not a professor of ecology. All the expedients that Carthage had tried to provide an ambitious standard of living, a broad niche, for her people, were denied her, except that of trade. She was not even allowed soldiers to defend her trade. She tried, but Roman pol-

iticians were closer to ecologists than was their general and they saw the conflict of interest. *Carthago delenda est* (Carthage must be destroyed) said one of them with every speech he made in the Senate.⁸ And it was so.

History books call the final destruction of Carthage "The Third Punic War" but when an almost unarmed city fights the soldiers of an imperial power the word "war" seems out of place. The legions arrived, "Pile your weapons on the beach." The people did. "Now move yourselves ten miles back from the sea and live there." It was an ecological sentence of death. So the people closed their gates, produced what makeshift weapons they could and fought the besiegers for a year until, house by house and family by family, all was torn to pieces. It was after this that salt was spread on the ruins.

The fate of Carthage is a fable for our times because the underlying needs and motives which led to her destruction are those for which all great wars are waged.^{9,10,11} Always we must expect that our Darwinian breeding strategy does and will increase the numbers of people wanting civilized and ambitious futures, however much we may note that birth rates are comparatively low in affluent society at the moment. Then the expedients are trade, technology, and people-export, for there are no others. And there are some requirements of a satisfactory human niche that cannot be supplied by improved technology alone: adventure, opportunity, the new start. As the wealthy and ambitious peoples crowd, so they jostle their neighbors.

The *lebensraum* armies of Germany and Japan in this century so obviously marched in the cause for which Rome destroyed Carthage that they require little comment here. Except perhaps to note that the way to wage a *lebensraum* (living space, or ecological) war, and yet to escape being blamed for it, is to win. I cannot think that Rome's final solution of the Carthaginian

problem was any better than other final solutions of which we have heard.

Yet the epic of Carthage has a direct lesson for us: a lesson beyond the general one of showing the causes of real war. The Carthaginian history is an example of the civilized island state forced to war in order to maintain the standards of its people. History is full of the military islands that build empires, whether they be literal islands, like Britain and Japan, or effective islands like Carthage itself, or Holland, hemmed into its marsh by people of alien language and religion. There is no way in which high civilization can thrive in such a state without trade and people-export. Both these expedients must be bolstered by technology to provide the tools of trade and initiative. And technology in such a people can always be turned into weaponry.

In this last matter of the weapons things have changed in the favor of the island state since the days of Carthage. Carthage lost her battles, in the last analysis, because her weapons were not good enough. To equal a legion you had to have a lifetime of training and this Carthage could not provide. But modern war allows the high technology civilization of an island aggressor to produce as fine a weapon as they, or any other state, can invent.

If you want to imagine World War III, think of a modern Carthage needing its Sicily or Spain. Suppose this warlike island country cannot get food, or oil, or raw materials, or that its people are discriminated against in trade and cannot travel; then there must be political pressure to use force. A nuclear strike against some backward continent may make very good sense. A strike with neutron bombs might be better still. I think it will happen: at least I cannot think of an historical precedent of people in a high civilization island refraining from the use of force when their rising numbers and ambitions had bumped against the island limits.

FOOTNOTES

1. P. A. Colinvaux, WHY BIG FIERCE ANIMALS ARE RARE, Princeton, N.J.: Princeton University Press, 1978.
2. D. L. Lack, THE NATURAL REGULATION OF ANIMAL NUMBERS, N.Y.: Oxford University Press, 1954. Lack shows that the clutch size of many song birds varies from season to season, depending on the food supply. In some species also, there has been shown to be a marked latitude effect, generally with the average nest having more eggs in northern latitudes, presumably as a response to the larger number of insects available in the early weeks of the northern spring. There is now a large literature correlating family size with resources in many animals. The matter is reviewed in pages 13-17 of WHY BIG FIERCE ANIMALS ARE RARE, op. cit.
3. P.A. Colinvaux, "The Human Breeding Strategy," NATURE, 1976, 261: 356-357. This phenomenon, often called the demographic transition, is fully understandable on ecological grounds. It is a fallacy that increasing material standards of living will prevent the population growing; it can only slow down the rate.
4. Our accounts of the condition of Carthage come only from the two Roman authors, Livy and Polybius, writing more than 200 years after the destruction of Carthage, but from contemporary written sources. Even though describing the affairs of a hated and beaten enemy, they make quite clear both the agricultural expertise and the admirable qualities of the Carthaginian constitution.
5. Montgomery of Alamein, A HISTORY OF WARFARE, London: Collins Press, 1968. For a quick grasp of the technology of the Roman Legion, and the way it was used to overcome even the most perfected phalanx of Macedon, the work of Field Marshal Montgomery is excellent. The practical soldier seems to have a desperately clear grasp of what it meant to meet a Roman Legion.
6. My authorities for the details of the Punic wars are Polybius and the interpretations of his writing by J. F. C. Fuller, THE DECISIVE BATTLES OF THE WESTERN WORLD, Vol. 1, London: Eyre and Spottiswoode, 1954. Montgomery of Alamein, A HISTORY OF WARFARE, London: Collins Press, 1968. B. H. Liddell Hart, A GREATER THAN NAPOLEON-SCIPIO AFRICANUS, London: Blackwood Press, 1926.
7. The most starkly realistic account of the Battle of Zama will be found in Liddell Hart, op. cit., Footnote No. 6.
8. Cato, The Censor.
9. P. A. Colinvaux, "An Ecologists View of History," THE YALE REVIEW 64: 357-369, 1975.
10. P. A. Colinvaux, THE FATES OF NATIONS: A BIOLOGICAL THEORY OF HISTORY, Simon and Schuster, N.Y., 383 p. 1980.
11. P. A. Colinvaux, "Towards a Theory of History: Fitness, Niche, and Clutch of *Homo sapiens* L." THE JOURNAL OF ECOLOGY, In Press.

Featured Research Program

Biology of Parasitic Angiosperms

by

J. L. Riopel, L. Musselman and D. G. Lynn

University of Virginia and Old Dominion University

Perhaps the most familiar parasitic plants of the southeast are the mistletoes that penetrate stems of our native trees and shrubs. There are about 60 additional species of parasitic flowering plants in the southeast. They are not as well known because they are root parasites. The roots form specialized knob-like organs termed haustoria that attach and penetrate the roots of neighboring host plants and provide a pathway for the transfer of water and nutrients from the host to the parasite.

These plants are a heterogenous group contained in eight angiosperm families. Most are hemiparasites. They are photosynthetic and capable of maturing to seed-set without a host. Often these plants have a very broad host range. Typical members are species of *Aureolaria* (False foxglove), *Agalinis* (Gerardia), and *Castilleja* (Indian paintbrush). In contrast, holoparasites are host dependent for completion of seed-set. Some, like *Epifagus virginiana* (Beechdrops) and *Conopholis americana* (Squawroot), lack chlorophyll while others such as *Striga asiatica* (Witchweed) are photosynthetic, but remain host dependent for other reasons. The holoparasites usually have more restricted host ranges and several species of *Orobanche* and *Striga* cause world-wide problems in agriculture.

There are very few studies of these interesting plants. We know little about their evolution. None have been found in the fos-

sil records and the only common parasitic feature is the haustorium with no agreement on its evolutionary origin. The ecology of these plants, where they occur, their interaction with other species, and the whole general area of population biology of these plants is virtually unknown.

There has likewise been very little physiological work. What restricts *Epifagus* to beech trees? Are the seeds specialized so that germination occurs in the presence of particular substances only characteristic of beech tree root exudate? No one knows. Seeds have never been germinated in the laboratory. Germination is also a mystery in Squawroot (*Conopholis americana*). These plants are associated with red oaks. We have found germinated seeds attached to oak mycorrhizal roots in the field, but we have been unable to duplicate the feat in the laboratory.

Our research involves parasitic members of three families of parasites, the Santalaceae, Scrophulariaceae, and Orobanchaceae. Field studies on native members of these families are principally conducted at Old Dominion University and the Mountain Lake Biological Station. Long term study plots of several species have been established at the Station with the purpose of monitoring annual population changes as they are influenced by environmental effects and alterations in host support. We are also studying the biology of the very

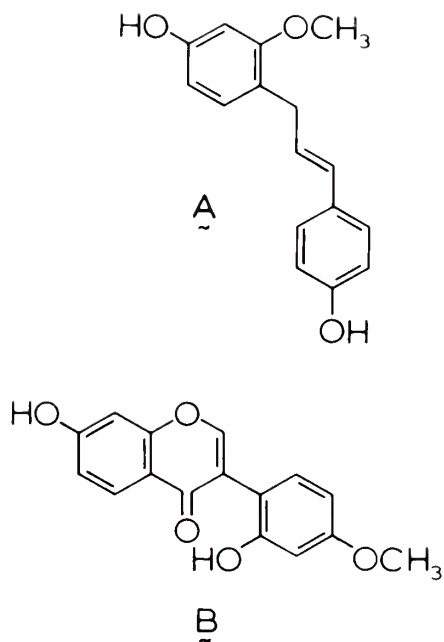


Fig. 1. Xenognosin a and b. Flavanoid molecules that induce host recognition responses in *Agalinis purpurea*.

rare southern Appalachian endemic shrub *Buckleya distichophylla* (Santalaceae) which occurs near Mountain Lake.

At Old Dominion University other field work has dealt with the floral biology of *Orobanche* and *Striga* with a view towards understanding factors involved in seed production. All species that we have examined to date are strongly protandrous. Morphotypes with distinct host specificity have apparently arisen in *S. gesnerioides* by repeated inbreeding due to autogamy. In addition, we are attempting to determine hosts for a recently discovered population of *O. ramosa* in Texas which could pose a threat to some commercial crops in that state.

At the University of Virginia, the purpose of the research has been to gain a better understanding of the development of the haustorium, the physiological factors influencing host-parasite interaction, and most recently, the biochemistry of host recognition.

Our findings on host recognition have proved the most interesting. *Agalinis purpurea* has been our study plant. Grown in sterile culture, very few haustoria develop. However, when *Agalinis* roots are exposed to host root exudate we find, often overnight, the initiation of many haustoria. This initiation rate is more rapid than for any other angiosperm multicellular organ. We have also observed that the later stages of attachment and penetration are indiscriminate with successful attachments occurring on a variety of substrates including self-attachments. Thus, the significant event in the parasite-host process is the initiation of the haustorium, a stage which discriminates self from host and is triggered by an exogenous chemical signal coming from the host root.

We recently isolated and synthesized two compounds that initiate the recognition process. As shown in Figure 1, these molecules are flavanoids and have been given the name xenognosin a and b (Greek *xenos*, meaning host, and *gignoskein*, meaning to recognize).

The use of flavanoids by these plants as host recognition molecules is interesting. Chemotaxonomic studies often rely on flavanoids as stable taxonomic characters. Have root parasites evolved to use these compounds for their own purposes of recognition? We are anxious to learn whether similar compounds are utilized by holoparasites with much more selective host ranges.

There are other questions. We do not understand how these structurally simple molecules are functioning in the recognition process. We are now synthesizing structural isomers of the xenognosins and they are often rendered inactive by very slight alterations. We hope to determine why this occurs and further, whether initiation results from the binding of haustorial elicitor to specific cell wall or plasma membrane sites. This is suggested by the narrow structural specificity we observe with xenognosins. Alternatively, differentiation perhaps is

triggered by the direct entry of these compounds into the cells.

Much of our present and future work is focused on *Striga asiatica*. This plant is a major crop parasite in many areas of the world, particularly in Asia and South Africa. It was discovered in the States in 1956 and is presently contained in a 31 county area in the coastal plain of North and South Carolina. It attacks species of grasses and in this country, represents a serious threat to our corn crop.

Striga is marvelously adapted to its life style. Seeds germinate only after a good soil soaking of several days and then not until corn roots are nearby. The USDA Witchweed Methods Laboratory in Whiteville has developed a system to bypass the natural germination signal with the use of ethylene injected into the soil before corn is established. This helps to control the spread of *Striga* but does not solve all the problems.

The first four to six days after germination are critical for the survival of *Striga*. In this time it must find a host. Over a few thousand years, it has evolved to do this very well. Our present challenge is to learn some of its secrets.

Summary Information

Research on Parasitic Angiosperms

Institutions: University of Virginia, Old Dominion University, and Mountain Lake Biological Station

Personnel—Principal Investigators:
J. L. Riopel, Department of Biology, University of Virginia, Charlottesville, Virginia 22901
D. G. Lynn, Department of Chemistry, University of

Virginia, Charlottesville, Virginia 22901

Lytton Musselman, Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23508

Post Doctoral Fellow:
V. Kamat, University of Virginia

Ph.D. Students:
Vance Baird, University of Virginia
Mark Lesny, University of Virginia
John Steffens, University of Virginia
Evelyn Kopke, University of Virginia

Funding Sources: National Science Foundation
USDA Competitive Research Grant
USDA-ARS Cooperative Research Agreement

References

Lynn, D. G., J. C. Steffens, V. S. Kamat, D. W. Graden, J. Shabanowitz, and J. L. Riopel. 1981. Isolation and characterization of the first host recognition substance for parasitic angiosperms. *J. Am. Chem. Soc.* 102: 1868–1870.
Nickrent, D. L., L. J. Musselman, J. L. Riopel, and R. E. Eplee. 1979. Haustorial initiation and non-host penetration in Witchweed (*Striga asiatica*). *Ann. Bot.* 43: 233–236.
Riopel, J. L. 1979. Experimental studies on induction of haustoria in *Agalinis purpurea*. Second Symposium Parasitic Weeds, North Carolina State University.
Riopel, J. L. and L. J. Musselman. 1979. Experimental initiation of haustoria in *Agalinis purpurea* (Scrophulariaceae). *Am. J. Botany* 66: 570–575.
Werth, C. R. and J. L. Riopel. 1979. A study of the host range of *Aureolaria pedicularia* (L.) Raf. (Scrophulariaceae). *The American Midland Naturalist* 102(2): 300–306.

Association Affairs

ABOUT THE RICHMOND MEETING

The Association of Southeastern Biologists will hold its 43rd Annual Meeting April 14–17, 1982, at Eastern Kentucky University in Richmond, Kentucky. Wednesday and Thursday registration, exhibits, and most paper sessions will be in the Carl D. Perkins Building located on the southern end of the campus. The general session and feature address, the symposia, and the annual business meeting will be in the Posey Auditorium in the nearby Stratton Building. The Friday night banquet, Retiring President's address, and announcements of awards and new officers will be in the Keen Johnson Building located in the center of campus.

To provide the most efficient service and the best facilities, ASB members and students are requested to PRE-REGISTER for the 1982 meeting by using the pre-registration form provided in this issue.

Eastern Kentucky University is honored to be the host of this popular annual meeting. A cordial welcome and southern hospitality are extended to all ASB members and their friends from one of the "northern schools."

SOCIETIES MEETING WITH ASB IN RICHMOND

Beta Beta Beta, Southeastern Region
Southeastern Division, American Society
of Ichthyologists and Herpetologists
Southeastern Fisheries Council
Southeastern Section,
Botanical Society of America
Southeastern Chapter,
Ecological Society of America
Southeastern Society of Parasitologists
Southern Appalachian Botanical Club

RICHMOND AND EASTERN KENTUCKY UNIVERSITY

Richmond, Kentucky, where the famed Blue Grass region meets the foothills of the Cumberlands, is an urban college community of about 20,000 in a rich agricultural area. Madison County is a cattle-producing county and the Richmond burley market is among the tobacco belt's largest.

Inter- and intra-state highway systems enhance Richmond's accessibility. Inter-state 75 (north-south) passes within a mile of the campus, and I-64 (east-west) is only 30 minutes away. Kentucky expressways, the Blue Grass, Mountain, Daniel Boone, and Cumberland Parkways, are also less than an hour's drive from Richmond.

Places of historic and scenic interest surround the University. Richmond, 24 miles south of Lexington on I-75, is within easy driving distance of White Hall State Shrine (eight miles), Fort Boonesborough State Park (12 miles), Herrington Lake (35 miles), Cumberland Falls (100 miles), the State Capital at Frankfort (50 miles), Natural Bridge State Resort Park and the Red River Gorge (63 miles), My Old Kentucky Home at Bardstown (85 miles), and the Kentucky Horse Park at Lexington (40 miles).

Eastern Kentucky University has an enrollment of more than 14,000 students, a student body that has nearly tripled since 1960. As a result, new dormitories and academic structures have been built. The physical plant value now exceeds \$140 million.

Founded in 1906 as a state college with a mission of teacher education, it has evolved into a large regional institution, achieving University status in 1966. Currently, Eastern is organized into nine col-

leges and a graduate school. The University offers a wide selection of curricula leading to a variety of degrees. More than 300 degree programs and options are organized on various levels leading to associate, baccalaureate, masters, specialist, and joint doctoral degrees. In addition, there are several one- and two-year special programs of study, pre-professional offerings, and sixth-year graduate offerings.

Graduate and undergraduate programs are available in the biological sciences in the College of Natural and Mathematical Sciences. At the undergraduate level, there are six programs of study leading to the Bachelor of Science degree: biology, biology-teaching, environmental resources, fisheries management, wildlife management, and microbiology. The department also provides pre-professional curricula to meet requirements for schools of medicine, dentistry, osteopathy, veterinary medicine, podiatry, and forestry. At the graduate level, the department offers the Master of Science degree in biology. A large number of the graduate students have planned curricula and research in fields such as wildlife management, ecology, fisheries, and aquatic biology. A graduate option in Applied Ecology and a University system of natural areas, along with active affiliation with Tech Aqua Biological Station and Gulf Coast Research Laboratories, further accentuate the ecological orientation of the department. For students who have completed their M.S. degree in biology at Eastern, further graduate work and research is possible through a joint doctoral Ph.D. program offered by the School of Biological Sciences at the University of Kentucky and Eastern Kentucky University.

PRE-REGISTRATION AND REGISTRATION

A PRE-REGISTRATION form is provided with this copy of the bulletin. Pre-registration will better enable us to provide

services and facilities that are expected at the ASB Annual Meeting. Late registration will be in the lobby of the Perkins Building on Wednesday from 5–9 P.M. and on Thursday 8 A.M.–5 P.M. NOTE: Pre-registration is cheaper (!) with fees of \$2.00 for students and \$4.00 for regular registration. Late registration will be the customary \$3.00 for students and \$5.00 for all others. LIMITED numbers of tickets will be available for breakfasts, luncheons, and the banquet at late registration. SABC/SE-BSA members please note that tickets are needed for the Friday breakfast. Use the pre-registration form.

TRAVEL TO RICHMOND AND EASTERN KENTUCKY UNIVERSITY

Automobile: Richmond is located approximately one mile east of Inter-state 75 on KY 876. All traffic from the south should exit onto this road (Exit 87). Members driving in from the north, east, or west from I-64 and I-75 may get off at Exit 90 (U.S. 25 south).

Air Service: The nearest airport is Bluegrass Field, located west of Lexington off U.S. 60. It is 40 miles northeast of Richmond (allow one hour driving time and follow the signs to I-75 south). Bluegrass Field is served by five airlines: Delta, US Air, Piedmont, Frontier, and Tennessee Airways. Five daily flights are available from Atlanta to Lexington. Car-rental agencies at the airport are Hertz, Avis, Budget Rent-A-Car, and National. Limousine service is available to Richmond at a rate of \$34.00 for up to four people; special arrangements can be made for groups. For limousine service from Lexington call (606) 252-2441.

Bus Service: Greyhound provides limited bus service to Richmond via Knoxville and Lexington. The bus depot is three blocks from the campus and approximately one mile from the Perkins Building.

ASB PRE-REGISTRATION FOR RICHMOND MEETING

(Type or Print, one for each registrant)
(Duplicate as needed)

Name _____

Institution _____

City _____ State _____ Zip Code _____

Please check the following:

REGISTRATION

Regular \$4.00 _____ Student \$2.00 _____

(Registration at meeting will be Regular \$5.00; Student \$3.00)

MEALS

ASB Banquet:		SE Chapter, Ecological	
Regular	\$8.00 _____	Society of America	
Student	\$6.00 _____	Luncheon	\$6.00 _____
SE Society of Parasitologists		Southern Appalachian	
Luncheon	\$6.00 _____	Botanical Club/SE Section,	
Beta Beta Beta		Botanical Society of America	
Luncheon	\$5.00 _____	Breakfast	\$5.00 _____

FIELD TRIPS

Lilley Cornett		Strip Mine	\$5.00 _____
Woods	\$5.00 _____	Kentucky River	
Red River Gorge	\$5.00 _____	Palisades	\$3.00 _____
Cumberland River			
Drainage	\$5.00 _____		

Make check for total amount payable to ASB.

Send copy of this form and check *by April 1st* to: Division of Natural Areas,
Keith Building 134, Eastern Kentucky University, Richmond, KY 40475.

DINING FACILITIES

Good food and adequate dining facilities are scattered in the Richmond area. A list of restaurants will be provided all registrants at the annual meeting. For convenience,

and good food at a reasonable price, we recommend that you take advantage of the meals offered on the pre-registration form. You will not beat the price and the excellent food provided at the banquet buffet on Friday evening.

LOCAL ALCOHOL MORES

Madison County is dry. The city of Richmond is partly wet (of all things) and locating a beer is a geopolitical lesson that is ludicrous at best. Therefore, a map to direct you to the various "watering holes" will definitely be included in the registration packet.

ACCOMMODATIONS

The large numbers of motels in cities hosting recent ASB meetings will not be available in Richmond. **IT IS RECOMMENDED THAT HOUSING ARRANGEMENTS BE MADE AS EARLY AS POSSIBLE.**

On-campus housing will not be available. Listed below are recommended accommodations. The rates are for 1981 and they are subject to change.

The number of rooms for each motel indicates the number presently being reserved for this meeting. Reservations should be made by April 1.

When making reservations, indicate that you are attending the ASB meeting.

IN RICHMOND, KENTUCKY:

DAYS INN (3 miles from Perkins Building)
I-75, Exit 90 (Exit 90-A if traveling south on I-75)
(606) 623-0880 Toll-free 1-800-241-9191
100 rooms reserved
1 person = \$18.00
2 people = \$25.02

HOLIDAY INN (1 mile from Perkins Building)
Eastern By-Pass, Exit 87 from I-75
(606) 623-9220 Toll-free 1-800-238-5400
100 rooms reserved (Group rates for ASB)
1 person = \$27.00
2 people = \$35.00

KNIGHTS INN (3 miles from Perkins Building)
I-75, Exit 90 (Exit 90-A if traveling south on I-75)
(606) 624-2612

75 rooms reserved (Group rates for ASB)
1 person = \$18.00
2 people = \$23.50

PENNY PINCHER INN (1 mile from Perkins Building)
Eastern By-Pass, Exit 87 from I-75
(606) 623-8126 Toll-free 1-800-447-4470
65 rooms reserved (Group rates for ASB)
1 person = \$18.99
2 people = \$22.99

THRIFTY DUTCHMAN (1 mile from Perkins Building)
Eastern By-Pass, Exit 87 from I-75
(606) 623-8813
75 rooms reserved
1 person = \$17.85
2 people = \$18.90
Rooms must be paid in advance.

NEAR RICHMOND, KENTUCKY:

SHERATON INN
I-75 at Athens-Boonesborough exit; 17 miles north of Richmond
(606) 269-4341
50 rooms reserved
1 person = \$40.00
2 people = \$45.00
Confirmation of reservations needs to be made one month before meeting or else they will be released. One night's deposit is required.

BOONE TAVERN HOTEL (Nationally known for regional food)
Main Street, Berea, Kentucky; 15 miles south of Richmond
To reserve call Ms. Lucy Nelson, (606) 622-1444 or write her in care of Special Programs, Eastern Kentucky University, Richmond, KY 40475.
20 rooms reserved
singles = \$18.00-35.00
doubles (1 bed) = \$23.00-30.00
doubles (twins) = \$28.00-30.00

CAMPING FACILITIES

Fort Boonesborough State Park: Located approximately 15 miles north of Richmond;

take White Hall-Boonesborough exit off I-75 and drive east. Cost: \$6.50/night with hook-up for tents and trailers; \$5.50/night without hook-up for tents and trailers. Phone (606) 527-3131.

Clay's Ferry Campground: Located approximately 10 miles north of Richmond off I-75 at Clay's Ferry exit. Opens April 1st, \$6.00/up to party of four, tents or trailers, includes electricity and water.

KOA Campground: Located approximately 10 miles north of Richmond off I-75 at Clay's Ferry exit. Two people, no hook-up, \$6.50; each additional person, \$1.00; tents or trailers; electric hook-up, \$8.50; full hook-up (sewer and electric), \$9.50.

GENERAL SCHEDULE

Wednesday:

Ecological Society of America, Southeastern Section Field Trip: 1-5 P.M. from Perkins Building. Vegetation and Environment of a Portion of the Interior Low Plateaus.

Late Registration: 5-9 P.M.: Perkins Building lobby.

Executive Committee meeting: 7:30 P.M.: locality to be determined.

Thursday: (Note Change in Time of General Session)

Late Registration: 8 A.M.-5 P.M.: Perkins Building lobby.

General Plenary Session: 8-9:30 A.M.: Posey Auditorium, Stratton Building. Welcome to EKU, general announcements, and feature address.

Symposium: Biota and Environment of the Interior Low Plateaus. Part I. Vegetation and Environment. 2-5 P.M.: Posey Auditorium, Stratton Building.

Paper sessions, placement service: Perkins Building.

Exhibits: Perkins Building lobby.

Business meetings and luncheons of affiliate societies: Perkins Building.

Cash Bar Social: 8-11 P.M.: location to be announced.

Friday:

Society and group breakfasts, business meetings: 7-9 A.M.: Perkins Building. Symposium: Biota and Environment of the Interior Low Plateaus. Part II. Fauna and Cave and River Systems. 8-10:30 A.M.: Posey Auditorium, Stratton Building.

ASB Business Meeting: 11 A.M.-noon: Posey Auditorium, Stratton Building.

Symposium: Ecological Genetics. 1-5 P.M.: Posey Auditorium, Stratton Building.

Paper sessions, placement service: Perkins Building.

Exhibits: Perkins Building lobby.

ASB Banquet: 7 P.M.: Keen Johnson Ballroom.

Cash Bar Social: 9-11 P.M.: location to be announced.

Saturday:

Executive Committee Breakfast and Meeting: 8:30 A.M.: Holiday Inn.

Field Trips: Begin at 8 A.M. in front of the Perkins Building.

POINTS OF INTEREST IN THE RICHMOND AREA

Keeneland Race Track: Thoroughbred horse racing at its finest just before the Kentucky Derby. Located approximately 35 miles north of Richmond across from Bluegrass Field (Lexington Airport) on U.S. 60. Take I-75 north to Athens-Boonesborough exit into Lexington to New Circle Road (KY 4) south. Take New Circle Road (KY 4) to Versailles exit (U.S. 60 west). Open April 2-23; Post time 1:30 P.M.; pari-mutuel betting; Admission: \$1.25 general admission, \$3.00 reserved seating.

Shakertown: Reconstructed example of the historic Shaker colonies of the 19th century; outstanding food served family-style at scheduled times. Located near Wilmore,

Kentucky approximately 55 miles from Richmond; take I-75 north to Lexington then U.S. 68 south. Admission: \$4.00/adult, \$1.00/child. Meals (lunch and dinner only) by reservation, \$8.00 or more. Phone (606) 734-5411.

Kentucky Horse Park: A state park dedicated to the horse; located in the center of the Blue Grass on I-75 and Iron Works Pike, Lexington, KY. Approximately 40 miles north of Richmond. Take Kentucky Horse Park exit off I-75. Open year-round, 7 days/week, 9 A.M. to 5 P.M. Admission: \$1.00/car parking fee; \$2.00/adult, \$1.50/child (7-12), under 6, free. See horse museum, equestrian courses; carriage rides. Phone (606) 233-4303.

Bybee Pottery: Nationally-known and long-established center of handmade pottery. KY 52 east of Richmond approximately 10 miles. Open Monday through Friday, 9 A.M. to noon and 12:30 P.M. to 4:30 P.M. Pottery on sale at the shop. Address: Bybee Pottery, P.O. Box 192, Waco, KY 40385.

Fort Boonesborough State Park: Located approximately 15 miles north of Richmond; Boonesborough-White Hall exit off I-75 and drive east.

Ashland, home of Henry Clay: Richmond Road, Lexington, KY. Located approximately 30 miles north of Richmond on U.S. 25. Take Athens-Boonesborough exit off I-75 to Lexington. Open year-round, 10 A.M. to 4 P.M. Admission: \$2.00/adult, \$.50/child. Phone (606) 266-8581.

Berea: Home of Berea College. Located approximately 15 miles south of Richmond, take exit 76 off I-75 south or U.S. 25. Several Appalachian craft stores. Churchill Weavers allows you to watch cloth weavers at work.

Central Kentucky Tours: Located in Lexington, KY. Conducts tours every day at 10 A.M. and 1:30 P.M. 434 Interstate Avenue, Lexington, KY 40505, exit 113 off I-75 and I-64. Phone (606) 299-0013.

The Greater Richmond Area Chamber of Commerce: 101 West Irvine Street, Richmond, KY 40475. Write for information on these and other areas of interest in and around Richmond.

LOCAL ARRANGEMENTS COMMITTEE

Chairman: William H. Martin (606) 622-3122

Pre-Registration and Registration: Robert Creek (606) 622-2079

Program: John P. Harley (606) 622-2271

Meeting Rooms, Audio-Visual: Barbara Abraham (606) 622-3019

Banquet, Meals, Social Events: Jon Maki (606) 622-2997

Exhibits: Thomas Keefe (606) 622-2115

Field Trips: Paul Cupp (606) 622-2271

Area Events: Sanford Jones (606) 622-2212

Parking and Transportation Information: Dan Varney (606) 622-2310

Motel Information: Biology Office (606) 622-2212

FIELD TRIPS

On Wednesday afternoon, prior to registration and the meeting, a short field trip sponsored by the Southeastern Chapter of the Ecological Society of America will provide a general overview of the Interior Low Plateaus in the vicinity of Richmond. Travel by pooling private vehicles.

Five major field trips are planned for Saturday, April 17. Transportation for these trips will be provided by university vehicles. All trips leave from the Perkins Building. Space will be limited, so you are urged to reserve a seat by using the *pre-registration* form. Times noted below refer to leaving and returning to Richmond. A slight readjustment of costs may be necessary at registration depending on participation. Any trip will be cancelled and money refunded if limited interest is shown. Costs do not include meals.

If use of your own vehicle(s) is preferred, please check with the field-trip desk at the time of registration.

Collecting is discouraged on all field trips, and will be permitted only for those persons who have obtained scientific collecting permits from the state.

1. **Lilley Cornett Woods** (8 A.M.–6 P.M.): The largest preserved remnant of mixed mesophytic forest that once covered the slopes of the Cumberland Plateau and Mountains of eastern Kentucky. It is a Registered National Natural Landmark managed by Eastern Kentucky University. The trip emphasizes vegetation composition and dynamics with an overview of research conducted at the Woods. Led by Dr. William H. Romme, Eastern Kentucky University (\$5.00/person).
2. **Red River Gorge** (8 A.M.–4 P.M.): A nationally recognized scenic area with numerous overlooks and hiking trails leading to natural rock formations such as rockhouses and natural bridges. The trip will provide an overview of vegetation and environment of the gorge with emphasis on spring flora and fauna; led by Max Medley, University of Louisville (\$5.00/person).
3. **Cumberland River Drainage** (8 A.M.–5 P.M.): The Cumberland River Drainage has the largest and most easily accessible assemblage of aquatic organisms in this part of Kentucky. This trip emphasizes observations of fishes and aquatic invertebrates at specific localities in the Cumberland River System. Led by Drs. Branley Branson and Guenther Schuster, Eastern Kentucky University (\$5.00/person).
4. **Strip-mining in eastern Kentucky** (8 A.M.–3 P.M.): A visit to an active strip-

mine operation to illustrate mining and reclamation techniques (probably mountain top removal). Led by personnel from the Kentucky Bureau of Surface Mining Reclamation and Enforcement (\$5.00/person).

5. **Kentucky River Palisades** (8 A.M.–1 P.M.): The scenic, entrenched Kentucky River System in this part of the state has an interesting geologic history that is unique in the Interior Low Plateaus. The trip emphasizes the relationships of vegetation, flora, and fauna to the topography and rock types of the Palisades. Led by Dr. William Bryant, Thomas More College (\$3.00/person).

ATTENTION ASB MEMBERS

We need nominations for the *Meritorious Teaching Award*! This is an outstanding award. In addition to the recognition by the ASB, the recipient receives \$1000. The deadline for nominations is extended to February 15, 1982. Please send nominations and supporting information to the Chairman of the Meritorious Teaching Award Committee, Dr. James L. Riopel, Department of Biology, University of Virginia, Charlottesville, VA 22901. Phone (804) 924-3981.

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE AND PLACES

Alabama

Birmingham-Southern College, Division of Science and Mathematics. *Dr. Paul C. Bailey* has resigned as Chairman of the Division to return to full-time teaching, research, and writing. He was replaced by *Dr. E. Douglas Waits*, Professor of Biology.

Florida

University of Florida, Department of Botany. *Dr. William Stern*, Chairman of the Department, and the retiring President of the American Society of Plant Taxonomists, presented his Presidential Address, entitled "Wellsprings of Botany" at the AIBS meetings in August. *Dr. James W. Kimbrough*, Professor, organized and moderated a symposium on "Highlights of the Taxonomy and Evolution of Fungi" for the Golden Anniversary Meeting of the Mycological Society of America. *Professor J. S. Davis* served as a consultant to the Venezuelan government on biological problems of their salt producing lagoons. *Dr. J. J. Ewel*, Professor, has been granted a sabbatical for the year. *Dr. Ronald L. Myers* has been appointed Teaching Post-doctoral Fellow to teach the introductory ecology course in *Dr. Ewel's* absence. *Francis F. Putz* will join the faculty in the Spring of 1982. *Dr. Indra K. Vasil*, Graduate Research Professor of Botany, has recently edited two volumes on "Perspectives in Plant Cell and Tissue Culture," which were published as Supplements XIA and XIB to the International Review of Cytology, by Academic Press, New York.

Florida State University, Department of Biological Sciences. New faculty appointments are: *Dr. W. Ross Ellington*, Assistant Professor (Comparative Physiology), *Dr. Gerard C. Gorniak*, Assistant Professor (Anatomy), *Dr. Malcolm Potts*, Assistant Professor (Microbiology), *Dr. Michael Meredith*, Associate in Research (Psychobiology), and *Dr. Byung-Dong Kim*, Associate in Research (Genetics and Cell Biology).

Florida Southern College, Division of Natural Sciences and Mathematics. *Dr. Margaret L. Gilbert*, ASB President Elect, has been named to the Nelson C.

White Chair in the Life Sciences. *Dr. Gilbert*, who serves as Chairman of the Division, is the first professor at the College to be named to a teaching chair in the 96-year history of this liberal arts institution. The Nelson C. White Chair was established by a gift from International Minerals and Chemical Corporation and is valued highly as a recognition of outstanding scholarship and teaching. Announcement of her appointment to the White Chair was made by *Dr. Robert A. Davis*, College President. *Mr. Thomas Mack*, Horticulture, retired in May 1981. *Dr. Malcolm Manners* has joined the faculty in Horticulture. *Dr. Rubert Prevatt*, Citrus, has been named Tyndall Professor of Citrus and Subtropical Horticulture.

Georgia

Georgia College, Department of Biology. Two additions to the faculty are: *William Wall* (Ph.D. University of Massachusetts) Vertebrate Natural History, and *Glenn Stokes* (Ph.D. Pennsylvania State University) Physiology.

University of Georgia, Department of Botany. At the annual meeting of the American Society of Plant Physiologists in Quebec, Canada, *Dr. Lee Herbert Pratt* received "The Charles Albert Shull Award for outstanding innovative research, which advanced our knowledge and understanding of phytochrome physiology, biochemistry, and biophysics." *Dr. Pratt's* exploitation of immunological techniques with plant tissues was truly pioneering and contributed significantly not only to the phytochrome field, but to plant physiology in general.

Louisiana

Tulane University, Department of Biology. Associate Professors *Leonard Thien* and *Joan Bennett* have been promoted to Professors of Biology.

Louisiana State University, Department of Botany. *Dr. Shirley C. Tucker* and *Dr. Russell L. Chapman* presented papers at the Thirteenth International Botanical Congress in Sydney, Australia. *Bruce K. Kirchhoff* is a Visiting Assistant Professor of Plant Anatomy for 1981-82. A search for a Botany Chairperson is in progress and all correspondence should be sent to *Dr. Shirley Tucker*, Department of Botany, Louisiana State University, Baton Rouge, LA 70803.

Mississippi

Gulf Coast Research Laboratory, Ocean Springs. *Dr. Lionel N. Eleuterius'* new publication *An Illustrated Guide to Tidal Marsh Plants of Mississippi and Adjacent States* was published in August 1981. The field guidebook covers 200 plant species which inhabit the tidal marshes of Mississippi, and also those of Alabama and Louisiana. *John Steen*, graduate research student and assistant planktologist, has received the Ph.D. in Biology from the University of Mississippi.

North Carolina

East Carolina University, Department of Biology. *Dr. Robert R. Christian* (Ph.D. University of Georgia) has been appointed Assistant Professor. *Dr. Gerhard W. Kalms* has been appointed Director of Undergraduate Studies.

Duke University, Department of Botany. *Professor Aubrey W. Naylor*, James B. Duke Professor of Botany, was the first recipient of the Leadership and Service Award (1981) from the Southern Section of the American Society of Plant Physiologists. *Dr. Naylor* also received the Charles Reid Barnes Honorary Life Membership Award. *Mr. Joseph S. Beckman*, graduate student, was presented a Graduate Student Award certificate in recognition of an outstanding presentation at the 1981 annual meeting of the American Society of Plant Physiologists and Monsanto Agricultural Products Co.

North Carolina State University, Botany Department. *Dr. Ann Larson* is working in Dr. Ralph Mott's tissue culture laboratory during the 1981-82 academic year. She is a plant anatomist from Sangamon State University, Springfield, IL. *Dr. Jerome P. Miksche (Botany)* and *Dr. Sam Levings (Genetics)* will participate in the AAAS Symposium "Plant Biology and Biotechnology in the 1980's" in Washington, DC on January 8, 1982.

North Carolina State University, Zoology Department. *Dr. Jeffrey R. Walters*, Assistant Professor, has been appointed to teach ornithology.

Elon College, Biology Department. *Dr. G. L. Ryals* resigned from the college in July 1981 to assume a position with Biomedical Reference Laboratories. *Dr. Herbert W. House* (Ph.D. University of South Carolina) has been appointed Chairman of the Department. *Dr. Nancy Harris* (Ph.D. North Carolina State University) has joined the biology faculty.

Duke Power Company Environmental Laboratories, Huntersville. The annual meeting of the Carolinas Area Benthological Workshops will be held November 5-6, 1981 at the Laboratories. The Southeastern benthologists have a new newsletter called *Instar 1*.

South Carolina

Francis Marion College, Department of Biology. *Ms. Evelyn R. Wilson* (M.S. University of South Carolina) has joined the faculty as a Temporary Instructor of Biology.

Erskine College, Department of Biology. *Dr. Patrick McArthur* (Ph.D. Northern Arizona University) has been appointed as an Assistant Professor of Biology. *Dr. McArthur* has most recently been a Postdoctoral Fellow at the Rockefeller University Field Research Center, New York.

Tennessee

University of the South, Department of Biology. *Dr. Harry Clay Yeatman* retired after 31 years of outstanding service. He is an authority on copepods and was the first William B. Kenan Professor at this University. *Dr. Cynthia Cowden* (Ph.D. University of Wisconsin) has been appointed Assistant Professor of Biology to teach invertebrate zoology, embryology, and general zoology.

Virginia

George Mason University, Department of Biology. A new Ph.D. program in Environmental Biology-Public Policy has been approved for the fall semester 1982. Students will receive training in traditional research areas of ecology and environmental biology as well as public policy, business administration, public affairs, economics, and statistics. Address inquiries to: *Dr. David W. Johnston*, Project Director, Environmental Biology-Public Policy, Department of Biology, George Mason University, Fairfax, VA 22030.

University of Richmond, Department of Biology. *Janet M. Nolin* has joined the staff to occupy the position of Research Biologist. She holds a two year grant with N.I.H. to investigate various aspects of hormonal regulation of target cell biology.

Virginia Polytechnic Institute and State University, Department of Biology. The Department is proud to announce the appointment of two new faculty: *Dr. Bruce Wallace*, formerly at Cornell University, joins as Professor of Zoology, and *Dr. Khidir W. Hilu*, Assistant Professor of Botany, comes to Tech from the University of Illinois.

West Virginia

Marshall University, Department of Biological Sciences. *Dr. Donald C. Tarter*, Professor, has been appointed as Chairman of the Department. *Dr. Tarter* is an aquatic biologist.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Florida

Fairchild Tropical Garden. *Dr. Roger Sanders* has been hired as Assistant Plant Taxonomist, with interests in the mint and verbena families. *Dr. Donovan Correll* has completed *Flora of the Bahama Archipelago*, and it is now in press. *Dr. David Steingraeber* completed a year's postdoctoral research on developmental anatomy of tropical trees. He joins the botany faculty of Colorado State University. *Dr. Knut Norstog* continues to serve as Editor-in-Chief of the *American Journal of Botany* whose editorial offices are located at the Garden.

John Young Science Center. The Exhibits Department has added three displays—one demonstrates that sound waves do not travel in a vacuum; another is a sand pendulum that combines two different periods of vibration resulting in the tracing of patterns on a wooden deck; and the third exhibit, currently under construction, demonstrates Newton's Third Law of Motion. The Science Center offered over 50 science-related classes for children ages 4 and above this past summer.

ABOUT BIOLOGICAL STATIONS

Mountain Lake Biological Station. Field Biology Post-doctoral fellowships are available for summer research at the Station in Giles Co., Va. These awards, funded by the University of Virginia, are for the purpose of promoting field research by young investigators who have recently received their Ph.D. degree. Proposals will be considered for a wide variety of ecological and evolutionary studies. The award provides for laboratory space, travel to the Station, living expenses, and a modest stipend. Deadline: April 1, 1982. Write to: Director, Mountain Lake Biological Station, Gilmer Hall, University of Virginia, Charlottesville, VA 22901.

Highlands Biological Station. The Station will offer several grants-in-aid to support ecological and taxonomic research in the Southern Appalachians in 1982. To qualify for consideration, the proposed research must focus on organisms or ecosystems of the southern Appalachians and require the facilities of the Sta-

tion. Applications for grants should be submitted prior to March 1.

Three field research courses on the biota of the Southern Appalachians will be offered:

FIRST TERM, JUNE 7–JULY 9

LICHENOLOGY IN THE SOUTHERN APPALACHIANS.

William L. Culberson, Professor of Botany, Duke University.

A field and laboratory study of the lichens of the Southern Appalachians. In addition, readings and discussions will examine the current knowledge of biology, physiology, and ecology of the lichens and the identification of specimens will include an introduction to chemosystematics, a field for which the lichens are particularly well known. Prerequisites: General botany, plant taxonomy, or permission of instructor. Senior-graduate level. Six semester hours.

ECOLOGY AND TAXONOMY OF AQUATIC INSECTS.

Lewis Berner, Professor of Zoology, University of Florida.

A field oriented course dealing with the taxonomy and biology of all stages of aquatic insects. Emphasis will be placed on ecological interrelationships and behavior of insects in an aquatic environment. Field trips, research projects, and lectures. Prerequisites: General biology, entomology, or permission of instructor. Senior-graduate level. Six semester hours.

SECOND TERM, JULY 12–AUGUST 13

BIOLOGY OF COLEOPTERA IN THE SOUTHERN APPALACHIANS.

Thomas C. Barr, Jr., Professor of Zoology, University of Kentucky.

An introduction to the biogeography of the Southern Appalachians which focuses on the ecology, systematics, distribution, and evolution of selected groups of beetles. The course is research oriented, and each student will be expected to pursue an individual research problem. Prerequisites: General zoology, entomology, or permission of instructor. Senior-graduate level. Six semester hours.

Further information on both the teaching and research programs, including application materials, can be obtained by writing Executive Director, Highlands Biological Station, P.O. Box 580, Highlands, North Carolina 28741.

ANNOUNCING

MOUNTAIN LAKE BIOLOGICAL STATION SUMMER COURSES 1982

First Term (June 14–July 17)

Aquatic Ecosystems

Daniel J. Hornbach, University of Virginia

Field Botany of the Southern Appalachians

Lytton J. Musselman, Old Dominion University

Mammal Behavior and Ecology

Jerry O. Wolff, University of Virginia

Plant Evolution and Geology

Judith E. Skog, George Mason University

Principles of Systematic Botany

Warren H. Wagner, University of Michigan

Second Term (July 19–August 21)

Biology of Insects

George W. Byers, University of Kansas

Evolutionary Ecology

Joseph Travis, Florida State University

Ecology of the Fungi

David F. Perry, Forest Pest Management Institute

Plant Ecology

Frank Day, Old Dominion University

Natural History of the Southern Appalachians

Robert C. Simpson, Lord Fairfax Community College

Woody Plants of the Appalachians

Charles R. Werth, Miami University of Ohio

Courses—4 to 6 semester credits.

Maximum course load each term—6 semester credits.

Scholarships Available: Service Awards for students covering room and board costs.

Post-doctoral Research Awards (10 weeks).

For further information and application write to: James L. Riopel, Director
Mountain Lake Biological Station
Gilmer Hall
University of Virginia
Charlottesville, VA 22901

Duplicate and give to colleagues and students.

APPLICATION FOR ASB MEMBERSHIP

Fill out blanks and enclose check or money order for one year's dues and mail to Dr. J. Charles O'Kelley, Biology Dept., Univ. of Alabama, University, AL 35486.

Name in full _____ Date _____

Title _____ Department _____

Institution _____

City _____ State _____ Zip _____

Preferred mailing address (if different from above) _____

Degrees (institutions and dates) _____

Recommended by member _____

Annual Dues:	_____ Graduate student	\$ 5.00	_____ Regular	\$10.00
	_____ Contributing	\$12.00	_____ Sustaining	\$25.00
	_____ Family	\$12.00		

U.S. POSTAL SERVICE STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685)		
1. TITLE OF PUBLICATION The ASB Bulletin (ISSN 0001-2346)		2. DATE OF FILING 28 Sept. 1981
3. FREQUENCY OF ISSUE Quarterly (January, April, July and October)		4. PUBLICATION NO. 0 3 3 2 0
5. COMPLETE MAILING ADDRESS OF KNOWN OFFICE OF PUBLICATION (Street, City, County, State and ZIP Code) (Not printer)		6. ANNUAL SUBSCRIPTION PRICE \$12.00
7. COMPLETE MAILING ADDRESS OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printer)		
8. FULL NAMES AND COMPLETE MAILING ADDRESS OF PUBLISHER, EDITOR, AND MANAGING EDITOR (This item MUST NOT be blank)		
9. OWNER (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) (Item must be completed)		
10. EXTENT AND NATURE OF CIRCULATION		
11. I certify that the statements made by me above are correct and complete		

PS Form 3526
July 1981

(See instruction on reverse)

(Page 1)



The ASB

QH301
.A78
*

59.06

BULLETIN

Volume 29, Number 2

April 1982

LIBRARY

APR 12 1982

A. M. N. H.



Maritime Forest

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

CAROL C. BASKIN
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

Past President — Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24504

President Elect — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Vice-President — Donald J. Shure, Biology, Emory University, Atlanta, GA 30322

Secretary — Carol C. Baskin, Biol. Sciences, University of Kentucky, Lexington, KY 40506

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —

Samuel B. Jones, Jr. (1982), Botany, University of Georgia, Athens, GA 30602

George S. Ramseur (1982), Biology, University of the South, Seawanee, TN 37375

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059

Sharon Patton (1984), Veterinary Pathobiology, University of Tennessee, Knoxville, TN 37916

AAAS Representative, Section G —

Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

Program of the 43rd Annual Meeting	31
Program Summary	34
Thursday Morning General Session	37
ASB Symposia	38
ASB Paper Sessions	40
Abstracts of Contributed Papers	51
Author Index	94
ASB Candidates for Office—1982	97
News of Biology in the Southeast	102

COVER

Maritime forest at Salter Path, Carteret Co., NC. Photo by Caroline Kenning Gross of Durham, NC. This photo won first place in the N.C. State Museum's Nature Photography Contest in the bl & w category. A \$50 cash prize was awarded. For information on the 1982 contest, contact Mary Kay Clark, 919/733-7450.

TIME AND PLACE OF FUTURE MEETINGS

1983	April 13–16	University of Southwestern Louisiana, Lafayette
1984	April	Memphis State University

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Company, Greenville, SC



Program of the 43rd Annual Meeting of the Association of Southeastern Biologists

Eastern Kentucky University, Richmond

Perkins Building

(606) 622-1444

A joint meeting with the Southeastern Section of the Botanical Society of America, the Southeastern Chapter of the Ecological Society of America, the Southern Appalachian Botanical Club, the Southeastern Society of Parasitologists, the Southeastern Region of Beta Beta Beta National Honorary Biological Society, the Southeastern Division of the American Society of Ichthyologists and Herpetologists, and the Southeastern Fisheries Council.

GENERAL INFORMATION

Registration and Information—Registration for the ASB meeting, purchase of meal tickets, and registration for field trips is arranged through PRE-REGISTRATION. Those who have pre-registered may obtain their information and ticket package at the Perkins Building Lobby on Wednesday (5 P.M.–9 P.M.) and on Thursday and Friday (8 A.M.–5 P.M.). Late registration is available at these times. Fees: \$3.00, students; \$5.00, regular.

Parking—Unrestricted parking is available in the Stratton Building Parking Lot across from the Perkins Building and along Kit Carson Drive (see campus maps). Parking on the main part of campus is difficult during the day, but limited shuttle bus service will be available. To obtain restricted parking permits for private cars on the main campus, inquire at the registration desk in the Perkins Building lobby. For the ASB Banquet at the Keen Johnson Building on Friday evening, ample parking space should be available along University Drive and in parking lots near the Keen Johnson Building (see campus maps).

Tickets for Scheduled Meals—Pre-registrants will receive the requested meal tickets in their registration packet. A limited number of tickets will be available for those who failed to pre-register.

Southeastern Chapter of the Ecological Society of America: Thursday Luncheon, \$6.00.

Southeastern Society of Parasitologists: Thursday Luncheon, \$6.00.

Southern Appalachian Botanical Club and Southeastern Section, Botanical Society of America: Friday Morning Breakfast, \$5.00.

Beta Beta Beta: Friday Luncheon, \$5.00.

ASB Banquet: Friday Evening, regular \$8.00; students \$6.00 (excellent buffet).

Placement Service—Room 204, Perkins Building is available for institutions with positions available and for individuals seeking employment. Space will be provided for posting institutional notices and announcements of available positions.

Space will also be provided for individuals who wish to post summary resumes, availability, and interests.

Dining and Tavern Facilities—A list of restaurants and their locations is furnished in the registration packet. Fast food places abound on the Eastern By-Pass. Restaurants on the Kentucky River are about 15 miles north of Richmond and can be reached by the Boonesborough–White Hall exit off I-75 North (Exit 95). A map of the locations of various lounges and taverns is included in the registration packet.

Field Trips—For up-to-date information on all trips, check the Field Trip Desk in the Perkins Building lobby.

Wednesday:

1. Overview of the Interior Low Plateaus (Southeastern Chapter, Ecological Society of America, Dr. William H. Martin, Leader).

Saturday:

1. Lilley Cornett Woods, 8 A.M.–6 P.M. (Dr. William H. Romme, Leader).
2. Red River Gorge, 8 A.M.–4 P.M. (Mr. Max Medley, Leader).
3. Cumberland River Drainage, 8 A.M.–5 P.M. (Drs. Branley Branson and Guenther Schuster, Leaders).
4. Strip-Mining in Eastern Kentucky, 8 A.M.–3 P.M. (Personnel of Kentucky Bureau of Surface Mining Reclamation and Enforcement).
5. Kentucky River Palisades, 8 A.M.–1 P.M. (Dr. William S. Bryant, Leader).

Points of Interest in the Kentucky Bluegrass Region—

1. U.S. Forest Service Research Center, Berea; research emphasis on strip mine reclamation; to schedule tours, phone 986-8431.
2. Keeneland Race Track, Lexington; Post Time 1:30 P.M. daily.
3. Shakertown near Wilmore, Kentucky; dining reservations (606) 734-5411.
4. Kentucky Horse Park, Lexington; daily 9 A.M.–5 P.M.
5. Bybee Pottery near Richmond; Monday–Friday, 9 A.M.–4:30 P.M.
6. Fort Boonesborough State Park near Richmond.
7. White Hall State Shrine (home of abolitionist Cassius Clay) near Richmond.
8. Ashland (Henry Clay's home), Lexington; 10 A.M.–4 P.M.
9. Appalachian Craft Stores, Berea.

Useful Phone Numbers (Area Code 606)—

University Information and Emergency 622-1444
University Safety and Security 622-2821
Madison County Ambulance Service 623-5121
Cardinal Travel Agency (for all airline reservations) 623-4324
Motel Information and Biology Department 622-2212
Richmond Chamber of Commerce 623-1220
AAA (Barger Wrecker Service) 623-5169
Pattie A. Clay Hospital 623-3131

Local Arrangements Committee—

Chairman—Dr. William H. Martin (622-3122)

Program—Dr. John P. Harley (622-2271)

Pre-Registration, Registration—Dr. Robert Creek (622-2079)

Banquet, Meals, Social Events—Dr. Jon Maki (622-2997)

Audio/Visual, Meeting Rooms—Dr. Barbara Abraham (622-3019)

Field Trips—Dr. Paul Cupp (622-2949)

Exhibits and Exhibit Rooms—Dr. Thomas Keefe (622-2115)

Transportation, Parking—Dr. Dan Varney (622-2310)

Special Events—Dr. Sanford Jones (622-2212)

Program Summary

WEDNESDAY, APRIL 14, 1982

- 1:00 P.M.–5:00 P.M. Field Trip: An Overview of the Interior Low Plateaus; Southeastern Chapter of the Ecological Society of America, Perkins Building Lobby.
- 5:00 P.M.–9:00 P.M. Pick up information and materials requested during pre-registration. Late registration, Perkins Building Lobby.
- 7:30 P.M. ASB Executive Committee Meeting: Holiday Inn, Board Room.

THURSDAY, APRIL 15, 1982

GENERAL SESSION: POSEY AUDITORIUM, STRATTON BUILDING

- 8:00 A.M.–9:30 A.M. Address of Welcome: *Dr. J. C. Powell*, President, Eastern Kentucky University. Response: *Dr. J. Frank McCormick*, ASB President, University of Tennessee at Knoxville. Featured Address: **Testing for Effects of Chemicals on Ecosystems**, *Dr. John Cairns, Jr.*, Distinguished Professor of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Registration, Information, and Paper Sessions

- 8:00 A.M.–5:00 P.M. Late Registration and Information, Perkins Building Lobby
- 8:00 A.M.–5:00 P.M. Banquet and Field Trip Reservations, Perkins Building Lobby
- 8:00 A.M.–5:00 P.M. Exhibits, Perkins Building Lobby
- 8:00 A.M.–5:00 P.M. Placement Service, Room 204, Perkins Building

Paper Sessions (no smoking)

- 10:00 A.M.–11:31 A.M. Animal Physiology, Session I, Room 221, Perkins Building
- 10:00 A.M.–11:44 A.M. Ichthyology and Herpetology, Session I, Conference Room A, Perkins Building
- 10:00 A.M.–11:44 A.M. Parasitology, Session I, Room 222, Perkins Building
- 10:00 A.M.–11:57 A.M. Plant Ecology, Session I, Conference Room B, Perkins Building
- 10:00 A.M.–11:44 A.M. Animal Ecology, Session I, Room 220, Perkins Building
- 10:00 A.M.–11:31 A.M. Aquatic Ecology, Session I, Room 212, Perkins Building
- 10:00 A.M.–11:57 A.M. Plant Systematics, Session I, Room 219, Perkins Building
- 10:00 A.M.–11:44 A.M. Developmental Biology, Session I, Room 225, Perkins Building

Business Meetings

- noon–1:30 P.M. Southeastern Division of the American Society of Ichthyologists and Herpetologists, Conference Room A, Perkins Building
- 7:30 P.M. Southern Appalachian Botanical Club Council, Room 211, Perkins Building

Business and Luncheon Meetings

- noon–2:15 P.M. Southeastern Society of Parasitologists. Featured Address: **African Trypanosomiasis: A Field and Laboratory Problem**, *Dr. J. Richard Seed*, Professor and Chairman, University of North Carolina at Chapel Hill. Conference Room C, Perkins Building

noon–1:30 P.M. Southeastern Chapter of the Ecological Society of America. Featured Address: **Catherine Keever's View of Old-Field Succession After 35 Years**, *Dr. Catherine Keever*, Professor Emeritus, Millersville (PA.) State College. Conference Room D, Perkins Building

Paper Sessions (no smoking)

1:30 P.M.–5:10 P.M. Symposium: Biota and Environment of the Interior Low Plateaus. I, Posey Auditorium, Stratton Building
 1:30 P.M.–2:48 P.M. Animal Physiology, Session II, Room 221, Perkins Building
 1:30 P.M.–4:06 P.M. Ichthyology and Herpetology, Session II, Conference Room A, Perkins Building
 2:30 P.M.–4:27 P.M. Parasitology, Session II, Room 222, Perkins Building
 1:30 P.M.–3:27 P.M. Animal Ecology, Session II, Room 220, Perkins Building
 1:30 P.M.–3:01 P.M. Aquatic Ecology, Session II, Room 212, Perkins Building
 1:30 P.M.–3:14 P.M. Developmental Biology, Session II, Room 225, Perkins Building
 1:30 P.M.–3:27 P.M. Invertebrate Zoology, Session I, Room 213, Perkins Building

Hospitality Hour

8:00 P.M.–11:00 P.M. **Pally's**, Main Street, Downtown Richmond, Cash Bar

FRIDAY, APRIL 16, 1982

7:00 A.M.–9:00 A.M. Business and Breakfast Meeting, Southern Appalachian Botanical Club and Southeastern Section, Botanical Society of America, Conference Room C, Perkins Building
 8:00 A.M. Past Presidents' Breakfast, Board of Regents' Room, Powell Building
 8:00 A.M.–5:00 P.M. Late Registration and Information, Perkins Building Lobby
 8:00 A.M.–noon Exhibits, Perkins Building Lobby
 8:00 A.M.–5:00 P.M. Placement Service, Room 204, Perkins Building

Paper Sessions (no smoking)

8:00 A.M.–10:30 A.M. Symposium: Biota and Environment of the Interior Low Plateaus. II, Posey Auditorium, Stratton Building
 9:15 A.M.–10:46 A.M. Cryptogamic Botany, Session I, Room 213, Perkins Building
 8:30 A.M.–10:40 A.M. Parasitology, Session III, Room 222, Perkins Building
 9:15 A.M.–10:46 A.M. Plant Ecology, Session II, Conference Room B, Perkins Building
 9:15 A.M.–10:59 A.M. Plant Systematics, Session II, Room 219, Perkins Building

Business Meetings

11:00 A.M.–noon ASB Annual Business Meeting, Posey Auditorium, Stratton Building
 noon Luncheon and Business Meeting, Beta Beta Beta, Conference Room C, Perkins Building
 noon Southeastern Fisheries Council, Conference Room A, Perkins Building

Paper Sessions (no smoking)

1:30 P.M.–4:00 P.M. Symposium: Ecological Genetics, Posey Auditorium, Stratton Building
 1:30 P.M.–5:00 P.M. Beta Beta Beta National Honorary Biological Society—District I, Conference Room B, Perkins Building, District II, Conference Room D, Perkins Building

1:30 P.M.-4:19 P.M.	Ichthyology and Herpetology, Session III, Conference Room A, Perkins Building
1:30 P.M.-4:58 P.M.	Plant Ecology, Session III, Room 221, Perkins Building
1:30 P.M.-3:14 P.M.	Plant Ecology, Session IV, Room 212, Perkins Building
1:00 P.M.-4:15 P.M.	Plant Systematics, Session III, Room 219, Perkins Building

ASB Banquet

7:00 P.M.	ASB Banquet. Presentation of Awards Past President's Address: Down the Pistil Barrel , <i>Dr. Franklin F. Flint</i> , Keen Johnson Ballroom, Keen Johnson Building
9:00 P.M.	Hospitality Session: Mule Barn , Arlington Center

SATURDAY, APRIL 17, 1982

8:00 A.M.	Field Trips. All field trips originate in front of the Perkins Building
8:30 A.M.	Executive Committee Breakfast and Meeting, Holiday Inn, Board Room

The Thursday Morning General Session

Testing for Effects of Chemicals on Ecosystems

The speaker for the 1982 general session is Dr. John Cairns, Jr., Distinguished Professor at Virginia Polytechnic Institute and State University.



Ascertaining the effects of chemicals on ecosystems is a complicated task, since a great variety of organisms are involved, each having quite different parameters of tolerance. Dr. Cairns is one of the prominent scientists working in this field. He has authored or co-authored over 300 papers, 23 books and monographs, and 134 chapters in books. The taxa that he has studied include the broad spectrum from microorganisms to vertebrates. He has been associated with almost 50 major corporations either as an advisor or to conduct research, and has been a member of numerous committees of national distinction. Dr. Cairns' current primary research areas are structure and function of protozoan communities, toxicity testing and thermal effects, development of rapid biological information systems, recovery and restoration of damaged ecosystems, and hazard education. His honors include the Presidential Commendation, The Charles B. Dudley Award for outstanding publication, and appointment as a Research Associate of the Academy of Natural Sciences in Philadelphia.

Dr. Cairns is widely recognized as an outstanding teacher and we can expect a stimulating presentation of a timely but complex topic.

This presentation is co-sponsored by ASB and the Southeastern Section of the Botanical Society of America.

ASB Symposia

All Symposia in Posey Auditorium, Stratton Building

BIOTA AND ENVIRONMENT OF THE INTERIOR LOW PLATEAUS

Symposium is co-sponsored by the Association of Southeastern Biologists, the Southeastern Chapter of the Ecological Society of America, and the Southeastern Section of the Botanical Society of America. Organizers: *Dr. Jerry M. Baskin*, University of Kentucky and *Dr. William H. Martin*, Eastern Kentucky University.

SESSION I—VEGETATION AND ENVIRONMENT, THURSDAY AFTERNOON

Presiding: *Dr. Jerry M. Baskin*, University of Kentucky

- 1:30 Introduction: William H. Martin, Eastern Kentucky University.
- 1:32 Chairman's Remarks: Jerry M. Baskin, University of Kentucky.
- 1:35 Geologic History of the Interior Low Plateaus: Donald C. Haney, Director, Kentucky Geological Survey.
- 2:10 Soils and Agriculture: Harry H. Bailey, University of Kentucky.
- 2:45 Vegetation Patterns: Elsie Quarterman, Vanderbilt University.
- 3:20 Barrens and Glades—Openings in the Forest: H. R. DeSelm, University of Tennessee at Knoxville.
- 3:55 Forests of the Bluegrass Region of Kentucky: William S. Bryant, Thomas More College.
- 4:30 Vegetation of the Western Section of the Interior Low Plateaus: James S. Fralish, Southern Illinois University at Carbondale.
- 5:05 Summary: Jerry M. Baskin, University of Kentucky.

SESSION II—FAUNA AND CAVE AND RIVER SYSTEMS, FRIDAY MORNING

Presiding: *Dr. J. Whitfield Gibbons*, Savannah River Ecology Laboratory

- 8:00 Chairman's Remarks: J. Whitfield Gibbons, Savannah River Ecology Laboratory.
- 8:05 The Cave Fauna: Thomas C. Barr, University of Kentucky.
- 8:40 Ramblings in a Delirium—Making Sense out of Aquatic Distributional Patterns: Branley A. Branson, Eastern Kentucky University.
- 9:15 Selected Vertebrate Distributions from the Purchase Area to the Mountains of Kentucky: Roger W. Barbour, University of Kentucky.
- 9:50 Man's Prehistoric Adaptation: Lathel F. Duffield, University of Kentucky.
- 10:25 Summary: J. Whitfield Gibbons, Savannah River Ecology Laboratory.

ECOLOGICAL GENETICS, FRIDAY AFTERNOON

Symposium is sponsored by the Association of Southeastern Biologists.

Organizer and Presiding: *Dr. Kenneth Shull*, Loyola University.

- 1:30 Introduction: J. Kenneth Shull, Loyola University.
- 1:35 Clinical Variations in the Size and Shape of Blackbirds: Frances C. James, Florida State University.
- 2:10 Components of Selection in *Drosophila pseudoobscura*: Wyatt W. Anderson, University of Georgia.
- 2:45 Migration and Gene Flow in Land Snails: James Murray, University of Virginia at Charlottesville.
- 3:20 Variability and Secondary Productivity in Vertebrate Populations: Michael H. Smith, Savannah River Ecology Laboratory.
- 3:55 Summary: J. Kenneth Shull, Loyola University.

ASB Paper Sessions

THURSDAY MORNING, APRIL 15

Animal Physiology, Session I—Room 221, Perkins Building

Presiding: *Dr. David J. Prior*, University of Kentucky

- 10:00 1. Tabatabai, Rebecca N. (Memphis State University). Effect of X-Rays on the Daily Variation of Mouse Blood Cells.
- 10:13 2. Lembke, Hannah, Gerald C. Llewellyn, and Richard R. Mills. (Virginia Commonwealth University). Zinc Absorption by the Midgut of the American Cockroach.
- 10:26 3. Jones, Barret E., T. Daniel Kimbrough, and Richard R. Mills. (Virginia Commonwealth University). Synthesis of Dopamine-N-Acetyltransferase During the Ecdysial Cycle of the American Cockroach.
- 10:39 4. Lohrman, Timothy, T. Daniel Kimbrough, and R. R. Mills. (Virginia Commonwealth University). An Analysis of Intestinal Protein Molecules as Related to Gut Motility in the American Cockroach.
- 10:52 5. Edwards, David F., R. R. Mills, and T. Daniel Kimbrough. (Virginia Commonwealth University). The Effects of Selected Biogenic Amines on Intestinal Motility in the Cockroach.
- 11:05 6. Mills, Richard R. and T. Daniel Kimbrough. (Virginia Commonwealth University). Burison Induced Stimulation of Blood Cell Protein Kinase by the American Cockroach.
- 11:18 7. Kimbrough, T. Daniel and Georgianna Ingersoll. (Virginia Commonwealth University). The Effects of Plant Serotonin Extracts on Perfused Animal Tissue.

Ichthyology/Herpetology, Session I—Conference Room A, Perkins Building

Presiding: *Dr. Paul V. Cupp, Jr.*, Eastern Kentucky University

- 10:00 8. Rooks, J. Russell and David C. Heins. (Millsaps College). The Reproductive Biology of the Naked Sand Darter, *Ammocrypta beani* Jordan, in Southeastern Mississippi.
- 10:13 9. Dorsett, Debora R. and David C. Heins. (Millsaps College). Reproduction of the Black-tail Shiner, *Notropis venustus* (Girard), in Southeastern Mississippi.
- 10:26 10. Anderson, Brian D., Robert K. Brown, and Jerry Learn. (University of Louisville). The Application of a Hybrid Index in Examining the Distribution of *Notophthalmus viridescens viridescens* and *Notophthalmus viridescens louisianensis* in Kentucky.
- 10:39 11. Dodd, C. Kenneth, Jr. (U.S. Fish and Wildlife Service). Nesting of the Green Turtle, *Chelonia mydas*, in Florida—A Hopeful Trend?
- 10:52 12. Ireland, Patrick H. (Radford University). Demography of Pond and Mountain Spring Populations of *Eurycea longicauda*.
- 11:05 13. Timmons, Tom J. (Auburn University). Resource Partitioning Between Largemouth Bass, *Micropterus salmoides*, and Yellow Perch, *Perca flavescens*, Young of the Year at West Point Lake—Alabama, Georgia.
- 11:18 14. Lindquist, David G., L. Michael Jones, John R. Shute, and Peggy W. Shute. (University of North Carolina at Wilmington and University of Tennessee). Spawning Success of the Waccamaw Darter under Artificial Substrates.
- 11:31 15. Schwartz, Frank J. (University of North Carolina). Correlation of Nest Sand Asymmetry and Percent Loggerhead Sea Turtle Egg Hatch in North Carolina Determined by Geological Sorting Analyses.

Parasitology, Session I—Room 222, Perkins Building

Presiding: *Dr. John P. Harley*, Eastern Kentucky University

- 10:00 16. Harley, John P. (Eastern Kentucky University). Canine Filariasis in Southcentral Kentucky.

- 10:13 17. Uglem, Gary L. and John P. Harley. (University of Kentucky and Eastern Kentucky University). Allosteric Transport of Uracil by *Hymenolepis diminuta*.
- 10:26 18. Granath, Willard O., Jr. and Gerald W. Esch. (Wake Forest University). Regulation of Mosquitofish Populations by *Bothriocephalus acheilognathi* (Pseudophyllidea) in a Predator-Free Lake.
- 10:39 19. Foster, Lewis A. and B. J. Bogitsh. (Vanderbilt University). Red Blood Cell Usage by *Schistosoma mansoni* Schistosomules in vitro.
- 10:52 20. Bogitsh, B. J. (Vanderbilt University). Ultrastructure of the Gastrodermis of *Brachycoelium salamandrae*.
- 11:05 21. Etges, David J. and B. J. Bogitsh. (Vanderbilt University). The Effect of Colchicine on (³H) Proline Incorporation in *Hymenolepis diminuta*.
- 11:18 22. Stringfellow, Frank and Frank W. Douvres. (U.S. Department of Agriculture). Factors Influencing Development of *Haemonchus contortus* to Young Adults in vitro.
- 11:31 23. Newsome, Anthony L. and Walter E. Wilhelm. (Memphis State University). Effect of Exogenous Iron and Iron Chelators on the Viability of Pathogenic *Naegleria fowleri*.

Plant Ecology, Session I—Conference Room B, Perkins Building

Presiding: *Dr. George T. Weaver*, Southern Illinois University at Carbondale

- 10:00 24. Parr, Patricia Dreyer and Fred G. Taylor, Jr. (Oak Ridge National Laboratory). Germination and Growth Effects of Hexavalent Chromium in Orocol TL on *Phaseolus vulgaris*.
- 10:13 25. Ogle, Douglas W. (Virginia Highlands Community College). Phytogeography of *Vaccinium macrocarpon* Aiton in the Southeastern United States.
- 10:26 26. Boom, Brian M. and Scott A. Mori. (New York Botanical Garden). Falsification of the Buttress-Liana Hypothesis.
- 10:39 27. Tuskan, Gerald A. and Armando A. De La Cruz. (Mississippi State University). Solar Input and Energy Storage in a Five-Year-Old American Sycamore Plantation.
- 10:52 28. Phillippi, Ann and Art Boebinger. (University of Kentucky and University of Tennessee at Knoxville). A Vegetational Analysis of Three Small Watersheds in Robinson Forest, Breathitt County, Kentucky.
- 11:05 29. Sutter, Robert D. (North Carolina Department of Agriculture). Is Venus Fly Trap (*Dionaea muscipula*) an Endangered Species?
- 11:18 30. Sutter, Robert D. (North Carolina Department of Agriculture). Collection Pressure, Population Structure, and the Survival of Ginseng (*Panax quinquefolium*) in North Carolina.
- 11:31 31. Vredeveld, Gene and Patricia Perfetti. (University of Tennessee at Chattanooga). Pollution Effects on *Pinus virginiana* as Determined by Growth Rings.
- 11:44 32. Winstead, Joe E. (Western Kentucky University). Differential Ion Uptake in Populations of *Andropogon virginicus* L. as an Adaptive Mechanism for Survival on Strip Mine Spoils.

Animal Ecology, Session I—Room 220, Perkins Building

Presiding: *Dr. James Howard*, Frostburg State College

- 10:00 33. Travis, Joseph. (Florida State University). Size at Metamorphosis in Amphibians: Test of a Model Based on Intraspecific Competition.
- 10:13 34. Petranks, James W. (University of Kentucky). Fish Predation: A Factor Affecting the Microdistribution of a Stream-Breeding Salamander.
- 10:26 35. Abraham, Barbara J. (Eastern Kentucky University). Predicting the Composition of Ground Stratum Spider Communities.
- 10:39 36. Murphy, Ginger A. (Eastern Kentucky University). Characteristics of Red-Cockaded Woodpecker (*Picoides borealis*) Cavity Trees in Kentucky.
- 10:52 37. Brown, Richard D. (University of North Carolina at Charlotte). Song Variation in the Louisiana Waterthrush, *Seiurus motacilla*.

- 11:05 38. Ferrell, Blaine R. (Western Kentucky University). The Effects of Photoperiod-Temperature Interactions on Testicular Recrudescence and Fattening in the Green Anole, *Anolis carolinensis*.
- 11:18 39. Wickelhaus, Teri L. (Western Kentucky University). The Effects of Photoperiod-Temperature Interactions on Testicular Regression and Fattening in the Green Anole, *Anolis carolinensis*.
- 11:31 40. Holmes, Laurence H., Jr. (Western Kentucky University). Spring Migratory Strategy in the Purple Finch, *Carpodacus purpureus*.

Aquatic Ecology, Session I—Room 212, Perkins Building

Presiding: *Dr. Donald C. Tarter*, Marshall University

- 10:00 41. Hackney, Courtney T. (University of North Carolina at Wilmington). Notes on the Ecology, Reproduction, and Limits of Distribution of the Carolina Marsh Clam, *Polyymesoda caroliniana*.
- 10:13 42. Dolin, Pamela S. and Donald C. Tarter. (Marshall University). Life History and Ecology of *Chauliodes rastricornis* and *C. pectinicornis* in Greenbottom Swamp, Cabell County, West Virginia.
- 10:26 43. Warren, Melvin L., Jr. (Kentucky Nature Preserves Commission). Observations on the Effects of Alkaline Mine Drainage on Small-Stream Ichthyofauna in Eastern Kentucky.
- 10:39 44. Camburn, Keith E. and Melvin L. Warren, Jr. (Kentucky Nature Preserves Commission). The Epizotic Occurrence of the Red Alga *Compsopogon coeruleus* on the Parasitic Copepod *Lernaea* from Kentucky Fish.
- 10:52 45. O'Bara, Christopher J., R. Don Estes, and William P. Bonner. (Tennessee Technological University). The Effects of Land Practice on the Water Quality and Fish of Sixteen Streams in the Big South Fork National River and Recreational Area, Tennessee and Kentucky.
- 11:05 46. Sanders, Carol B. and Charles M. Cooper. (University of Mississippi and USDA Sedimentation Laboratory). A Preliminary Study of the Pelecypod Fauna of the Coldwater River System, Mississippi.
- 11:18 47. Mamaril, Augustus C. and Armando A. De La Cruz. (Mississippi State University). Seasonal Zooplankton Assemblages in a Small Subtropical Impoundment.

Plant Systematics, Session I—Room 219, Perkins Building

Presiding: *Dr. Richard Stalter*, St. John's University

- 10:00 48. Westmoreland, Gail R. (Southern Illinois University at Carbondale). The Genus *Hydrophyllum* in Illinois.
- 10:13 49. Westmoreland, Gail R. (Southern Illinois University at Carbondale). Flora of the Union County Conservation Area, Illinois.
- 10:26 50. Hardin, James W. (North Carolina State University). A Ferruminate Leaf Surface in *Rhododendron*.
- 10:39 51. Coile, Nancy C. and Samuel B. Jones, Jr. (University of Georgia). Systematics of *Lychnophora* Mart. (Compositae: Vernonieae).
- 10:52 52. MacLeish, Nanda F. F. (University of Georgia). Systematics of *Eremanthus* Less. and Related Vernonieae Genera.
- 11:05 53. Stritch, Lawrence R. (Southern Illinois University at Carbondale). A Floristic Survey of the Hayes Creek Canyon Watershed, Pope County, Illinois.
- 11:18 54. Benson, Kimberly Boster. (University of Louisville). A Systematic Investigation of Three Species in the Genus *Polygonatum* (Liliaceae).
- 11:31 55. Pilatowski, Ronald E. (Ohio State University). Chemical Variation in *Aesculus glabra* L. and *A. octandra* Marsh. (Hippocastanaceae).
- 11:44 56. Nesom, Guy L. (Memphis State University). Fruit Structure, Seed Release, and Seed Dispersal in Species of *Trillium*.

Developmental Biology, Session I—Room 225, Perkins Building

Presiding: *Dr. Gerhard W. Kalmus*, East Carolina University

- 10:00 57. Harrison, Frederick W. and Ronald R. Cowden. (Western Carolina University and East Tennessee State University). Sialic Acid Patterns During Oogenesis and Larval Development in *Eunapius fragilis* (Leidy).
- 10:13 58. Pennington, Sam, Gerhard W. Kalmus, and Robert W. Wilson. (East Carolina University). Characterization of Liver Alcohol Dehydrogenase in the Developing Chick Embryo.
- 10:26 59. Grant, William C., Jacob S. Hanker, Beverly L. Giammara, David Garippa, and Frederick H. Whittaker. (North Carolina State University, University of North Carolina, and University of Louisville). Peroxidase Methods for Differentiating Eosinophils from Heterophils.
- 10:39 60. Cofie, Nathan and Arthur L. Williams. (University of Kentucky). Molecular Regulation of the iLv Gene Cluster of *Escherichia coli* K-12.
- 10:52 61. Pennington, Sam N., Gerhard W. Kalmus, and John W. Boyd. (East Carolina University). The Fetal Alcohol Syndrome and Brain cAMP: The Influence of Varied Ethanol Concentrations on cAMP Levels in the Chick Embryo Brain.
- 11:05 62. Teare, Catherine A. (University of Alabama). Fitness of *Drosophila melanogaster* in Randomly Varying Environments.
- 11:18 63. Just, John J. and Deborah Ann Check. (University of Kentucky). Cellular Quantitation of the Red Blood Cell Transition During Natural Metamorphosis in *Xenopus laevis*.
- 11:31 64. Harris, Joseph B. (University of Wisconsin at Stevens Point). Effects of Kinetin on Aging Tobacco Leaves.

THURSDAY AFTERNOON, APRIL 15

Animal Physiology, Session II—Room 221, Perkins Building

Presiding: *Dr. Eugene C. Crawford*, University of Kentucky

- 1:30 65. Dupre, Keith R., Eugene C. Crawford, Jr., and John J. Just. (University of Kentucky). Shifts in Cutaneous Thermal Sensitivity During Metamorphosis of *Rana catesbeiana* Tadpoles.
- 1:43 66. Phifer, Curtis X. and David J. Prior. (University of Kentucky). Dehydration Induced Reduction of Feeding Behavior in *Limax maximus*.
- 1:56 67. Prior, David J. (University of Kentucky). Water Regulatory Behavior and Neuronal Tolerance to Dehydration in Terrestrial Slugs.
- 2:09 68. Hess, Stephen D. and David J. Prior. (University of Kentucky). Effects of Hemolymph Osmolarity on the Isolated Pedal Ganglion of the Terrestrial Slug, *Limax maximus*.
- 2:22 69. Dickinson, Patsy and Frederic Nagy. (University of Kentucky and Laboratoire de Neurobiologie Comparee). Neuronal Modulation of a Rhythmic Behavior in Rock Lobsters.
- 2:35 70. Hornby, Pamela J. and Leo S. Demski. (University of Kentucky). Cardiac Changes Evoked by Electrical Stimulation of the Brain in the Anesthetized Gold Fish, *Carassius auratus*.

Ichthyology/Herpetology, Session II—Conference Room A, Perkins Building

Presiding: *Dr. Floyd Scott*, Austin Peay State University

- 1:30 71. Mulligan, Timothy J. and Franklin F. Snelson, Jr. (University of Maryland). Summer-Season Populations of Epibenthic Marine Fishes in the Indian River Lagoon System, Florida.
- 1:43 72. Perschbacher, Peter W. and Frank J. Schwartz. (Texas A & M University and University of North Carolina). Occurrence and Ecology of Four Species of *Anchoa* in the Cape Fear River and Adjacent Atlantic Ocean, North Carolina Region 1973-1978.

- 1:56 73. Grindstaff, Steve and Jerry L. West. (Western Carolina University). Relationships Between Hatching and Emergence Success of Brook Trout and Trout Biomass with Suspended Solids and Intragravel Characteristics in a Heavily Silted and Relatively Unsilted Western North Carolina Stream.
- 2:09 74. West, Jerry L. and Steve Grindstaff. (Western Carolina University). Lack of Movement of Brown Trout (*Salmo trutta*) in a Western North Carolina Trout Stream.
- 2:22 75. Angus, Robert A. (University of Alabama at Birmingham). A Temperature-Sensitive Melanistic Mutation Discovered in a Natural Population of Sailfin Mollies (*Poecilia latipinna*).
- 2:35 76. Vitt, Laurie J. and Raymond D. Semlitsch. (Savannah River Ecology Laboratory). Environmental Assessment: Significance of Long-Term Ecological Studies.
- 2:48 BREAK
- 3:01 77. Vangilder, Larry D., Richard T. Hoppe, and Robert A. Kennamer. (Savannah River Ecology Laboratory). A Bio-Telemetry Study of the Behavior and Thermal Biology of the American Alligator.
- 3:14 78. Johnston, Gail F. (Mississippi State University). Functional Morphology of External Oral Features of Anuran Tadpoles.
- 3:27 79. Mitchell, Sandra L. (Mississippi State University). Feeding Ecology of *Sooglossus garlineri* (Sooglossidae: Anura).
- 3:40 80. Shipp, Robert L. and Robert Jones. (University of South Alabama and Harbor Branch Foundation). Population Estimates of Deep Water Reef Fish Populations by Use of Visual Techniques from a Research Submersible.
- 3:53 81. Tyler, William A. and Robert L. Shipp. (University of South Alabama). Population Estimates of Commercial Fishes Using Mark/Recapture and Visual Census from the Florida Middle Grounds.

Parasitology, Session II—Room 222, Perkins Building

Presiding: *Dr. Gary Uglem*, University of Kentucky

- 2:30 82. Krissinger, Wayne A. (Georgia Southern College). A Scanning Electron Microscopic Investigation of the Outer Surface of *Lutztrema monenteron* and *Lutztrema microstomum* (Trematoda: Dicrocoeliidae).
- 2:43 83. Major, Vicki, Sharon Patton, and C. S. Patton. (University of Tennessee Veterinary College). Interesting Helminths from a Raccoon in East Tennessee.
- 2:56 84. Patton, Sharon and Sandra Strawbridge Johnson. (University of Tennessee Veterinary College). Preliminary Survey of Parasites in Dairy Goats in East Tennessee Based on Fecal Examinations.
- 3:09 85. Edwards, Robert W. (University of North Carolina at Chapel Hill). Cellular Interactions in the Immune Response of Mice Infected with *Nippostrongylus brasiliensis*.
- 3:22 BREAK
- 3:35 86. Lyons, E. T. (University of Kentucky). Prevalence of Microfilariae (*Onchocerca* spp.) in Skin of Kentucky Horses at Necropsy.
- 3:48 87. Patton, Sharon. (University of Tennessee Veterinary College). Enzyme-Linked Immunosorbent Assay in the Diagnosis of Occult Dirofilariasis in Dogs.
- 4:01 88. Grant, William C., Jacob S. Hanker, Norman F. Weatherly, Grover C. Miller, and Beverly L. Giammara. (North Carolina State University, University of North Carolina, and University of Louisville). Peroxidases in Schistosome Egg Granuloma.
- 4:14 89. Mobley, Ron and G. C. Miller. (North Carolina State University). Some Digenetic Trematodes of Bolivian Bats.

Animal Ecology, Session II—Room 220, Perkins Building

Presiding: *Dr. Blaine Ferrel*, Western Kentucky University

- 1:30 90. Brown, Luther and Sara Morsches. (George Mason University and Mt. Lake Biological Station). Social Organization in a Fungus Beetle Population (*Bolitotherus cornutus*, Coleoptera: Tenebrionidae).

- 1:43 91. Bartalon, James G. and Luther P. Brown. (George Mason University). Male Horn Size and Access to Mates in the Forked Fungus Beetle, *Bolitotherus cornutus*.
- 1:56 92. Rafii-Tabatabai, F. and M. L. Kennedy. (Memphis State University). Seasonal Food Habits of Raccoon (*Procyon lotor*) in Tennessee.
- 2:09 93. McCauley, David E. (Vanderbilt University). The Behavioral Components of Sexual Selection in the Milkweed Beetle *Tetraopes tetraophthalmus*.
- 2:22 94. Reynolds, John D. and Joseph P. Chinnici. (Virginia Commonwealth University). Comparative Infrared Spectra of Strains and Hybrid Strains of *Drosophila melanogaster*.
- 2:35 95. Wise, Dwayne A. (Mississippi State University). Meiosis in Spermatocytes of Lycosid Spiders.
- 2:48 96. Risley, Lance S., Clayton S. Gist, and D. A. Crossley, Jr. (University of Tennessee at Knoxville and University of Georgia). Canopy Arthropod Dynamics in Successional Old-Field and Mature Forested Ecosystems.
- 3:01 97. Howard, James H. and James G. Devereux. (Frostburg State College and Appalachian Environmental Laboratory). Habitat Preferences of Sympatric Salamanders of the Genus *Desmognathus*.
- 3:14 98. Shelton, Paul A. (Tennessee Technological University). The Environmental Impact of Tennessee State Route 29 Upon the Avifauna of Adjacent Lands.

Aquatic Ecology, Session II—Room 212, Perkins Building

Presiding: *Dr. Rudolph Prins*, Western Kentucky University

- 1:30 99. Tolbert, Virginia R. and Erin E. Brewer. (Oak Ridge National Laboratory and University of the South). A Comparison of Responses of Growth Rates of Creek Chubs from Undisturbed and Surface-Mining-Disturbed Streams to Differences in Food Ration Size.
- 1:43 100. Cooper, Charles M. and Jerry C. Ritchie. (USDA, Sedimentation Laboratory and USDA, National Program Staff). Net Plankton from Lake Chicot, Arkansas, a Sediment-Limited Ecosystem.
- 1:56 101. Yehl, Timothy C. and E. L. Morgan. (Tennessee Technological University). Toxicity of Scrubber Sludge, Ash Sludge, and Effluent from Settling Ponds at a Coal-Fired Power Plant to Simplified Microcosm Consisting of *Daphnia pulex*, *Hexagenia munda*, and *Lirceus fontinalis*.
- 2:09 102. Leung, Tat-Sing, Syed M. Naqvi, and Cornelius Leblanc. (Southern University). Basagran (Bentazon) and Diquat Toxicity to Mosquitofish, *Gambusia affinis*.
- 2:22 103. Small, James W., Jr. and David I. Richard. (Rollins College). Ecological Effects of Grass Carp Introduction on a Central Florida Lake.
- 2:35 104. Pratt, James R. and John Cairns, Jr. (Virginia Polytechnic Institute and State University). The Rate of Species Export from Islands: An Experimental Approach with Protozoan Communities.
- 2:48 105. Lisle, John T. and David N. Mardon. (Eastern Kentucky University). Influence of Recreational Activity, Precipitation and Water Turbidity on Selected Microorganisms in the Kentucky River Near Boonesboro State Park.

Developmental Biology, Session II—Room 225, Perkins Building

Presiding: *Dr. John J. Just*, University of Kentucky

- 1:30 106. Petersen, Raymond L., William G. Thorne, and W. Lena Austin. (Howard University). Effects of Cytochalasin B on *Physarum polycephalum*.
- 1:43 107. Steffens, John C., David G. Lynn, and J. L. Riopel. (University of Virginia). Molecular Specificity of Haustoria Induction in *Agalinis purpurea*.
- 1:56 108. Baird, Wm. Vance and James Riopel. (University of Virginia). Host-Parasite Interface: Attachment of *Agalinis purpurea* to a Host.
- 2:09 109. Niemeier, Sue E. and Robert A. Young. (Southern Illinois University at Carbondale). Comparative Analysis of Leaf Protein from Five Populations of *Crotalaria sagittalis* L.
- 2:22 110. Stone, Benjamin P. (Austin Peay State University). Bacitracin Reversal of GA & IAA Enhanced Plant Growth Responses.

- 2:35 111. Phillips, Donald L. (Emory University). Water Potential of *Viguiera porteri*; Endpoint Recognition in Pressure Bomb Determinations.
- 2:48 112. Kivic, P. A. and P. L. Walne. (University of Tennessee at Knoxville). Photosensory Transduction in *Euglena*: Repetitive Stimulation Causes Anomalous Results.
- 3:01 113. Ashley, Terry. (University of Tennessee at Knoxville). Nonhomologous Synapsis Along Portions of X and Y Chromosomes in Mice and its Possible Implications.

Invertebrate Zoology, Session I—Room 212, Perkins Building

Presiding: *Dr. Steve C. Dial*, Pfeiffer College

- 1:30 114. Nugen, Charlene and Donald C. Tarter. (Marshall University). Larval *Hydropsyche* and *Symphitopsyche* Records in West Virginia (Trichoptera: Hydropsychidae).
- 1:43 115. Palmer, Jacqueline M. (Western Carolina University). Cytochemical Observations of Silk Glands in the Primitive Spiders *Antrodiaetus unicolor* and *Liphistius desultor*.
- 1:56 116. Nelson, Diane R., Robert O. Schuster, and A. A. Grigarick. (East Tennessee State University and University of California at Davis). Heterotardigrada of Northern Venezuela.
- 2:09 117. Rufty, Luann and Ronald V. Dimock, Jr. (Wake Forest University). Localization of Sensory Receptors Implicated in the Mucous Trail Following Behavior of *Ilyanassa obsoleta*.
- 2:22 118. Dunn, Debra C. and Ronald V. Dimock, Jr. (Wake Forest University). Mechanisms of Intraspecific Mucous Trail Following by the Mud Snail *Ilyanassa obsoleta*.
- 2:35 119. Werner, William E. and Ronald V. Dimock, Jr. (Wake Forest University). Discrimination of Potential Molluscan Hosts by the Symbiotic Water Mite *Unionicola formosa*.
- 2:48 120. Del Portillo, Hernando A. and Ronald V. Dimock, Jr. (Wake Forest University). The Chemical Induction of Negative Phototaxis of the Symbiotic Water Mite *Unionicola formosa*.
- 3:01 121. Driscoll, Colleen. (Wake Forest University). The Behavior and Physiology of the Leech, *Placobdella parasitica*, as they Relate to the Basking Habit of Turtles.
- 3:14 122. Jetton, Thomas L. (Western Carolina University). Cytological and Cytochemical Investigations of Development from Dormant Gemmules in the Marine Sponge, *Haliciona loosanoffi*.

FRIDAY MORNING, APRIL 16

Cryptogamic Botany, Session I—Room 213, Perkins Building

Presiding: *Dr. Robert Creek*, Eastern Kentucky University

- 9:15 123. Clark, Jim D. (University of Kentucky). Slime Mold Senescence and Lifespan.
- 9:28 124. Frederick, Lafayette and Fitz Patrick Rigby. (Howard University). Myxomycetes from Bark of Australian and New Zealand Trees.
- 9:41 125. Varney, D., M. Siegel, W. Nesmith, L. Bush, and M. Johnson. (Eastern Kentucky University and University of Kentucky). Aspects of Chemical Control of the Endophyte, *Epichloe typhina*, in Fescue.
- 9:54 126. O'Kelley, J. Charles. (University of Alabama). Zygote Production in *Chlorococcum echinozygotum* Starr.
- 10:07 127. Renzaglia, Karen S. and Taylor C. Scott. (East Tennessee State University and Southern Illinois University). Morphology and Development of the Stellate Gemmae of *Blasia pusilla* (Hepatophyta).
- 10:20 128. Phillips, Andrew and Raymond L. Petersen. (Howard University). Effects of Heavy Metal Ions on Fern and Moss Gametophyte Growth and Development.
- 10:33 129. Whiton, John C. and James D. Lawrey. (George Mason University). Possible Allelopathic Effects of Lichen Secondary Compounds.

Parasitology, Session III—Room 222, Perkins Building

Presiding: *Dr. William L. Current*, Auburn University

- 8:30 130. Miller, Grover C. (North Carolina State University). Longevity of a Strigeoid Trematode, *Pharyngostomoides procyonis*, in the Raccoon.
- 8:43 131. Upton, Steve J. and Donald W. Duszynski. (Auburn University and University of New Mexico). Development of *Eimeria funduli* in *Fundulus heteroclitis*.
- 8:56 132. Whitlock, Suzanne A., William L. Current, and John V. Ernst. (Auburn University and USDA-AR). The Life Cycle of *Eimeria roperi* in the Cotton Rat, *Sigmodon hispidus*.
- 9:09 133. Reese, Norman C., William L. Current, John V. Ernst, and W. S. Bailey. (Auburn University and USDA-AR). Human and Calf Cryptosporidia in Mice and Rats.
- 9:22 134. Current, William L. and Norman C. Reese. (Auburn University). Endogenous Development of Calf Cryptosporidia in Suckling Mice.
- 9:35 135. Ernst, John V., William L. Current, and Gerald W. Benz. (USDA-AR and Auburn University). The Sexual Stages of *Eimeria wyomingensis* in Experimentally Infected Calves.
- 9:48 136. Lindsay, David S., William L. Current, and John V. Ernst. (Auburn University and USDA-AR). Life Cycle of *Isopora suis* of Swine.
- 10:01 137. Henshaw, Nancy G. (University of North Carolina at Chapel Hill). *Pneumocystis carinii*: Freeze-fracture Ultrastructure.
- 10:14 138. Chang, C. B., M. P. Thompson, and J. P. Harley. (Eastern Kentucky University). The Parasites of White-Tailed Deer (*Odocoileus virginianus*) from Central Kentucky.
- 10:27 139. Edwards, Robert W. and John R. Seed. (University of North Carolina at Chapel Hill). Population Density of *Trypanosoma brucei gambiense* in two Different Anatomical Compartments of the Mouse.

Plant Ecology, Session II—Conference Room B, Perkins Building

Presiding: *Dr. Philip A. Robertson*, Southern Illinois University at Carbondale

- 9:15 140. Delcourt, Paul A. and Hazel R. Delcourt. (University of Tennessee at Knoxville). Mapping and Calibration of Pollen and Forest Dominance for Tree Species in the Southeast.
- 9:28 141. Delcourt, Hazel R., Paul A. Delcourt, and Thompson Webb III. (University of Tennessee at Knoxville and Brown University). Dynamic Plant Ecology: Lessons from the Past, Implications for the Future.
- 9:41 142. Cridlebaugh, Patricia A. (University of Tennessee at Knoxville). Macrofossil and Pollen Evidence for Paleoenvironmental Change in the Lower Little Tennessee River Valley, East Tennessee.
- 9:54 143. Davidson, Jean L. (University of Tennessee at Knoxville). Paleocological Analysis of Holocene Vegetation, Lake in the Woods, Cades Cove, Great Smoky Mountains National Park.
- 10:07 144. Phillips, Donald L. (Emory University). Granite Outcrops: An Analysis of Plant Life-Forms.
- 10:20 145. Ramseur, George S., Paul R. Saunders, and Garrett A. Smathers. (University of the South, Washington State University, and U.S. National Park Service). Secondary Succession Following Fire in the Plott Balsam Mountains of North Carolina.
- 10:33 146. Stalter, Richard and Steve Dial. (St. John's University and Pfeiffer College). Some Ecological Observations of the Stinking Cedar, *Torreya taxifolia* Arn.

Plant Systematics, Session II—Room 219, Perkins Building

Presiding: *Dr. Gordon Hunter*, Tennessee Technological University

- 9:15 147. Stucky, Jon M. and Robert L. Beckmann. (North Carolina State University). Pollination Biology, Self-incompatibility, and Sterility in *Ipomoea pandurata* (L.) G. F. W. Meyer (Convolvulaceae).

- 9:28 148. Werth, Charles R. (Miami University at Oxford). Genetic Uniformity in *Galax*.
- 9:41 149. Jacobs, Brian F., Charles R. Werth, and Sheldon I. Guttman. (Miami University at Oxford). Allozyme Variation in Eastern U.S. *Abies*.
- 9:54 150. Shealy, Harry E. (University of South Carolina at Aiken). Henry W. Ravenel—19th Century South Carolina Botanist.
- 10:07 151. Perry, James D. (University of North Carolina at Asheville). Evidence of Hybridization in Georgia Piedmont Horseweeds.
- 10:20 152. Johnson, Miles F. (Virginia Commonwealth University). Studies in the Flora of Virginia: Asclepiadaceae.
- 10:33 153. Thompson, Ralph L. (Berea College). Floristic Analysis of the Lily Surface-Mine Experimental Area, Lily, Kentucky.
- 10:46 154. Davenport, L. J. (University of Alabama). Seed Morphology in *Hydrolea* (Hydrophyllaceae) and its Taxonomic Significance.

FRIDAY AFTERNOON, APRIL 16

Ichthyology/Herpetology, Session III—Conference Room A, Perkins Building

Presiding: *Dr. Frank Schwartz*, University of North Carolina at Chapel Hill

- 1:30 155. Whitman, Pamela A. and Joseph A. Marshall. (West Virginia University). Tonic Immobility in Juvenile Sandbar Sharks, *Carcharhinus plumbeus* (Nardo).
- 1:43 156. Jandebeur, Thomas S. and Michael G. Chapman. (Athens State College). A Report on the Fishes of the Paint Rock River System in Alabama.
- 1:56 157. Jandebeur, Thomas S. (Athens State College). A Status Report on the Spring Pygmy Sunfish, *Etheostoma* sp., in Northcentral Alabama.
- 2:09 158. Greene, Judith L., Gary B. Moran, and J. Whitfield Gibbons. (Savannah River Ecology Laboratory). Behavioral Responses of Freshwater Turtles to Drought.
- 2:22 159. Patterson, Karen K. and J. Whitfield Gibbons. (Savannah River Ecology Laboratory). The Abundance and Diversity of Herpetofauna Utilizing a Southeastern Stream and Floodplain.
- 2:35 160. MacGregor, John and Gregory Sievert. (Kentucky Fish and Wildlife Resources and Eastern Kentucky University). The Geographic Distribution of Salamanders of the Genus *Plethodon* in Kentucky.
- 2:48 BREAK
- 3:01 161. Finstrom, Matthew F. (Knoxville Zoological Park). An Unusual Defensive Display in a Nest Guarding Malayan Pit Viper.
- 3:14 162. Gibbons, J. Whitfield. (Savannah River Ecology Laboratory). Survivorship and Longevity of Long-Lived Vertebrates: How Long do Turtles Live?
- 3:27 163. Frazer, Nat B. (University of Georgia). The Survival Rate of Juvenile Loggerhead Sea Turtles (*Caretta caretta*) Necessary to Maintain a Stable Population Size.
- 3:40 164. Ross, Stephen T. and William J. Matthews. (University of Southern Mississippi and University of Oklahoma). The Effects of Physical Factors on Fish Community Structure in Brier Creek, Oklahoma.
- 3:53 165. Marion, Ken R. (University of Alabama at Birmingham). Lizard Reproductive Strategies: Caloric Determination of Between-Clutch Egg Sizes in a Southeastern Population of Fence Lizards, *Sceloporus undulatus*.
- 4:06 166. Bortone, S. A., C. R. Gilbert, R. E. Jenkins, and J. L. Oglesby. (University of West Florida, University of Florida, and Roanoke College). Ichthyofaunal Cluster Analysis of the Western North Atlantic River Drainages.

Plant Ecology, Session III—Room 221, Perkins Building

Presiding: *Dr. Joe E. Winstead*, Western Kentucky University

- 1:30 167. Simpson, Lisa B. (Western Kentucky University). The Effects of Experimental Acid Rain Applications on Biomass and Chlorophyll Levels of *Xanthium strumarium* L.
- 1:43 168. Cantrell, Buddy. (Vanderbilt University). Methodological Considerations in a Numerical Study of the Floristic Biogeography of the Southeastern United States.
- 1:56 169. Cantrell, Buddy. (Vanderbilt University). A Comparative Evaluation of Results from Several Numerical Techniques Used in a Biogeographical Study of the Southeastern United States.
- 2:09 170. Thomas, Richard B., J. Daniel Pittillo, and Garrett A. Smathers. (Western Carolina University and U.S. National Park Service). Invasion of *Fagus grandifolia* into a High Elevation Heath Bald at Craggy Gardens, NC.
- 2:22 171. Bellis, Vincent. (East Carolina University). Vegetative Cover and Biomass in an Oligohaline Riverine Marsh.
- 2:35 172. Gladden, J. B., K. W. Kleiner, C. A. McCaffrey, and R. R. Sharitz. (Savannah River Ecology Laboratory). Vegetation Recovery and Zonation Along a Disturbed Southeastern Coastal Plain Stream.
- 2:48 BREAK
- 3:01 173. Carter, Richard. (Vanderbilt University). The Flora of the Delta National Forest.
- 3:14 174. McDonald, Charles B. and Andrew N. Ash. (East Carolina University). Structure and Successional Trends of an Atlantic White Cedar (*Chamaecyparis thyoides*) Forest in Tyrrell County, North Carolina.
- 3:27 175. Ash, Andrew N. and Charles B. McDonald. (East Carolina University). Structure and Species Composition in Tall and Short Pocosin as They Relate to Succession.
- 3:40 176. Hannan, Richard R. (Kentucky Nature Preserves Commission). A Vegetation Survey of Bottomland Hardwood Forests in West-Central Kentucky.
- 3:53 177. McLeod, Kenneth W. (Savannah River Ecology Laboratory). Contribution of a Nuclear Fuel Chemical Separations Facility to the Plutonium Concentration of Tobacco.
- 4:06 178. White, Peter S. and George S. Ramseur. (Great Smoky Mountains National Park and University of the South). Island Biogeography of the Southern Appalachian High Peaks.
- 4:19 179. Solomon, Jean A. (Oak Ridge National Laboratory). Statistical Analysis of a Large Unbalanced Data Set: Mercury Distribution in Vegetation.
- 4:32 180. Schmalzer, Paul A. and H. R. DeSelm. (University of Tennessee at Knoxville). Forest Vegetation of the Obed Wild and Scenic River, Tennessee.
- 4:45 181. Smathers, Garrett A. and J. Daniel Pittillo. (U.S. National Park Service and Western Carolina University). Fog Interception in the Spruce-Fir Forest Zone in North Carolina.

Plant Ecology, Session IV—Room 212, Perkins Building

Presiding: *Dr. Donald L. Phillips*, Emory University

- 1:30 182. Stalter, Richard, William Nieter, Michael Locascio, and Stanley Bulanowski. (St. John's University). A Forty-Five Year History of the Arborescent Vegetation of Alley Pond Park, Queens County, New York.
- 1:43 183. Brennan, Michael E. and James S. Fralish. (Southern Illinois University at Carbondale). A Study of Site and Vegetal Relationships in Forest Communities in the Ozark Plateau of Illinois.
- 1:56 184. Baskin, Jerry M. and Carol C. Baskin. (University of Kentucky). Germination Ecophysiology of Eastern Deciduous Forest Herbs: *Hydrophyllum macrophyllum*.
- 2:09 185. Robertson, Philip A. (Southern Illinois University at Carbondale). Effects of Spring Burning on a Native Shortleaf Pine Stand in Randolph County, Illinois.
- 2:22 186. Travis, Joseph. (Florida State University). Comparative Demography of Populations of *Amianthium muscaetoxicum*.

- 2:35 187. Sharitz, R. R., C. A. McCaffrey, and J. B. Gladden. (Savannah River Ecology Laboratory). Vegetation Recovery Patterns in a Disturbed Southeastern Swamp Forest.
- 2:48 188. Bowers, Frank D. (University of Wisconsin at Stevens Point). A Preliminary Report on the Bryophyte Flora of Selected Oceanic Bogs of the Maritime Provinces of Canada.
- 3:01 189. Warner, David A. and James S. Fralish. (Southern Illinois University at Carbondale). A Study of Mid-Canopy Species in Upland Forest Communities in the Ozark Plateau of Illinois.

Plant Systematics, Session III—Room 219, Perkins Building

Presiding: *Dr. Gene S. Van Horn*, University of Tennessee at Chattanooga

- 1:00 190. Jones, Ronald L. (Eastern Kentucky University). Variation in *Aster patens* Ait.
- 1:13 191. Oskins, Wanda S. (Southern Illinois University at Carbondale). The Water Dynamics and Flora of Big Oak Tree State Park, Missouri.
- 1:26 192. Carter, Richard. (Vanderbilt University). Morphological Relationships Among the Species of *Cyperus* sect. Umbellati from North America.
- 1:39 193. Coffey, Janice C. (St. Mary's College). What are Prophylls, Auricles and Ligules? How to Use a Rush Key.
- 1:52 194. Evans, Dan K. (Marshall University). Biosystematics of *Carex* Section Squarrosae.
- 2:05 195. Farmer, Janis M. and C. Ritchie Bell. (University of North Carolina at Chapel Hill). Population Differences in Germination of *Axlepias syriaca* L. Seeds.
- 2:18 196. Sadowski, Thomas S. (Southern Illinois University at Carbondale). Sectional Relationships of *Pithecellobium*.
- 2:31 197. Webber, R. Michael. (North Carolina State University). The Taxonomy of *Saxifraga careyana* and *Saxifraga caroliniana*.
- 2:44 BREAK
- 2:57 198. Patrick, Thomas S. (University of Tennessee at Knoxville). The Use of Pollen Sculpturing to Determine Relationships in *Trillium*.
- 3:10 199. Mellichamp, T. Lawrence. (University of North Carolina at Charlotte). *Astilbe crenatiloba*: Extinct or Non-Existent?
- 3:23 200. Mellichamp, T. Lawrence and James F. Matthews. (University of North Carolina at Charlotte). Introgressive Hybridization in a Piedmont Population of Pitcher Plants (*Sarracenia*).
- 3:36 201. Tolman, Dianne C. (University of North Carolina at Charlotte). *Ranunculus subcordatus*: Species Biology of an Endangered North Carolina Endemic.
- 3:49 202. Rayner, Douglas A. (South Carolina Wildlife and Marine Resources Department). Granite Flatrock Outcrops in South Carolina: Part II.
- 4:02 203. Comeaux, Barry L. (North Carolina State University). Taxonomic Studies on the Native Grapes of North Carolina.

Abstracts of Contributed Papers Presented at the 43rd Annual Meeting of the Association of Southeastern Biologists Richmond, Kentucky

(Arranged alphabetically by senior author)

ABRAHAM, BARBARA J. Eastern Kentucky University--Predicting the composition of ground stratum spider communities.

Ground stratum spiders from several areas of the U.S. are compared. Western, shrub-dominated communities, with variations in climate, species composition of vegetation and elevation, have similar ground-dwelling families of spiders. Spider families of the eastern deciduous forest floor are remarkably similar to those of the West. This implies that many ground-dwelling families of spiders have broad tolerance limits for environmental variables such as litter depth and micro-climate, and can be predicted for numerous community types. Individual species within a family seldom duplicate this tolerance range, because they do not possess the entire collection of adaptive strategies present at the family level. Species therefore will usually replace one another with significant changes in climate, vegetation, etc. Grouping large numbers of species into smaller numbers of categories facilitates study of community structure and function. For the reasons given above, guilds comprised of individual spider species, not whole families, will be most useful in studies of competition, resource partitioning, etc.

ANDERSON, BRIAN D., ROBERT K. BROWN, and JERRY LEARN. University of Louisville--The application of a hybrid index in examining the distribution of *Notophthalmus viridescens viridescens* and *Notophthalmus viridescens louisianensis* in Kentucky.

A hybrid index based on pigmentation patterns was devised and applied to 509 specimens of *Notophthalmus viridescens viridescens* and *N. v. louisianensis* collected in Kentucky. The clinal distribution of these values when plotted against longitude suggests that a broad zone of intergradation occurs across most of Kentucky. While the formal genetics of the inheritance of adult pigmentation patterns has not yet been studied, these data would indicate that individuals collected from this area which appear intermediate in pigmentation pattern are indeed intergrades.

ANGUS, ROBERT A. University of Alabama-Birmingham--A temperature-sensitive melanistic mutation discovered in a natural population of sailfin mollies (*Poecilia latipinna*).

Two melanistic sailfin mollies (a male and a female) were collected at Key Largo, Florida in 1979. Phenotype ratios produced by these fish and subsequent lab progeny matings are consistent with a single-gene model. The melanistic allele shows incomplete dominance and expression of the melanistic phenotype is significantly influenced by temperature. Both homozygotes and heterozygotes for the mutant allele develop melanistic spotting sooner and to a greater extent when raised at cooler (21 C), as compared to warmer (28 C), temperatures. Penetrance of the mutant allele in the heterozygous state is reduced at warmer temperatures.

ASH, ANDREW N. and CHARLES B. McDONALD. East Carolina University--Structure and species composition in tall and short pocosin as they relate to succession.

Pocosin is a general term for several evergreen shrub bog communities that are dominated by *Pinus serotina* and usually underlain by peat. Successional sequences in pocosin are difficult to recognize due to the frequent occurrence of fire. The structure and species composition of two types of pocosin, tall and short, were compared to aid the understanding of successional processes and trends. Analysis of species composition, species importance values and standing crop of dominants indicates that while both systems are dominated by the same canopy species the shrub and herb layers differ considerably. Such differences suggest that tall and short pocosin are stages of two different successional sequences rather than separate stages within a single sequence.

ASHLEY, TERRY. University of Tennessee--Nonhomologous Synapsis along portions of X and Y chromosomes in mice and its possible implications.

During pachytene of meiosis in mice, men, and most other mammals, the X and Y chromosomes are synapsed for a portion of their length. This paired portion has been assumed to be a

region of homology, in which crossing over and chiasmata formation occurs in classic fashion. In turn, the presumed chiasmata has been assumed to be the mechanism which holds the X and Y together until Anaphase I, thus assuring their normal disjunction. The unsynapsed or "differentiated" regions, on the other hand, have been regarded as incapable of synapsing with anything else. Recently cytogenetic studies utilizing electron microscopic examination of microspread spermatocytes have uncovered a second phase of meiotic pairing in autosomal bivalents and univalents. Termed "synaptic adjustment", it is characterized by nonhomologous pairing. This is a report of nonhomologous synapsis during synaptic adjustment of the differentiated portions of the X and Y chromosomes with Chromosome 7 of mice heterozygous for the R5 translocation. In addition, a wide variation in the amount of synapsis between the X and Y in different inbred strains of mice will be reported. Since the "differentiated" region is defined as that portion of the X and Y which does not synapse, the future usefulness of this term as a functional definition seems questionable. It is further suggested that the nonhomologous synapsis in the "differentiated" region of the sex chromosomes, along with the vast differences between strains in amount of "differentiated" region, as reflected in percentage of the X and Y which synapse, raise critical questions as to whether or not any of the synapsis observed between the sex chromosomes actually reflects homology.

BAlRD, W. VANCE and JAMES RlOPEL.
University of Virginia -- Host-Parasite
Interface: Attachment of Agalinis
purpurea to a Host.

The attachment of Agalinis purpurea (Scrophulariaceae), a root hemi-parasite, to its host was studied experimentally. Plants are grown aseptically and then induced to form haustoria (the organs specialized for attachment) by exposure to a host root or to a chemical inducing substance. The haustoria are then placed in contact with various hosts or host substrates. These haustoria show a characteristic time course of attachment competency. This ability to attach correlates with the appearance of "papillae" on haustorial hairs. The data suggest that specific substances are produced by the haustorial hairs which play a major role in the attachment phenomenon. The chemical nature of this cementing compound is currently under study.

JAMES G. BARTALON and LUTHER P. BROWN.
George Mason University--Male horn size
and access to mates in the forked fungus
beetle, Bolitotherus cornutus.

Male forked fungus beetles possess a pair of horns arising from the pronotum and extending over their heads. Females do not have horns. While horn size tends to increase with body size, there is considerable variation in horn sizes among males of equal body size. Field and laboratory observations have shown horns to be used in aggressive interactions between males but the relative importance of horn and body

sizes to male aggressive and mating activities has not previously been examined. Here we report such an examination. Pairs of males having equal elytra lengths but horns differing in length by at least .5 mm were combined in the presence of a single female. Longer horned males of a pair were observed courting and mating significantly more often ($p=.05$) than shorter horned males. However, beetles of all horn sizes courted with equal frequency when pairs were separated. In similar experiments, males of equal horn length but different elytra lengths were paired. In this case there was no significant difference in the frequency of mating and courtship between large and small males. We conclude that relative horn size, and not body size, is an important determinant of access to mates in the forked fungus beetle.

BASKIN, JERRY M. and CAROL C. BASKIN.
University of Kentucky--Germination
ecophysiology of eastern deciduous for-
est herbs: Hydrophyllum macrophyllum.
Hydrophyllum macrophyllum Nutt. (Hydrophyllaceae) occurs in mesic deciduous forests from western Virginia and West Virginia, to Illinois, and south to Georgia, Alabama and Arkansas. At the time of seed maturation and dispersal in mid to late July, seeds exhibit both root and shoot dormancy. High temperatures are required to break root dormancy, and in the laboratory 77-85% of the seeds produced roots at a daily thermoperiod of 15/6°C following a 2- to 4-week warm treatment at a daily thermoperiod of 30/15°C. In the habitat root dormancy is broken during summer and early autumn, and roots emerge from the seeds in late autumn. After root emergence, moist chilling is required to break shoot dormancy; 100% of the seeds (with emergent roots) produced shoots at a daily thermoperiod of 20/10°C after they were chilled at 5°C for 6 weeks. In the habitat shoot dormancy is broken during winter, and shoots are produced in late winter and early spring. Germination of a portion of the seeds in a given year's seed crop may be delayed for several years. Root emergence from seeds kept on soil under leaf litter in an unheated greenhouse occurred during the first, second and third autumns following planting of freshly-matured seeds.

BELLIS, VINCENT J. East Carolina University--Vegetative cover and biomass in an
oligohaline riverine marsh.

Studies of coastal marsh productivity have emphasized broad tidal marshes bordering estuaries. The work presented here describes the vegetative cover and provides end-of-season live biomass estimates for a narrow oligohaline marsh bordering a tributary to the Pamlico River Estuary in North Carolina. Interpretation of aerial photographs verified by line transects revealed a patchy vegetative cover pattern consisting of small irregular clumps of two or more species dominated by one of them. Conspicuous vegetative cover types together with their estimated end-of-season live standing crop were:

Spartina cynosuroides 1124 g/m² (July), mixed annuals - principally *Amaranthus cannabinus* and *Aster subulatus* - 1286 g/m² (September), *Juncus roemerianus* 862 g/m² (August-September), *Cladium jamaicense* 460 g/m² (July), and *Typha* spp. 244 g/m² (July). An independent estimate of end-of-season standing crop biomass was provided by analysis of 96-0.25 m² clip plots selected at random from two adjacent marshes during early September. This study gave a mean end-of-season live biomass of 1857 g/m². Analysis of variance showed significant difference between marshes (p<0.01) and between sample points (p<0.0001) but no significant differences between clip plots dominated by the same plant species. It was concluded that these oligohaline marshes are comparable in productivity with more saline coastal marshes. High variability in biomass at different locations within the marsh is due to the tendency for two or more plant species with different biomass peaks to clump together in varying proportions. A second cause of variability may result from obvious differences in relative vigor between nearby stands of similar species composition.

BENSON, K.B. University of Louisville--
A systematic investigation of three species in the genus *Polygonatum* (Liliaceae).
Specimens of *Polygonatum biflorum* (Walt.) Ell., *P. canaliculatum* (Muhl.) Pursh, and *P. pubescens* (Willd.) Pursh, were examined to determine species validity and to address the problem concerning the status of *P. canaliculatum*, which may be an autopolyploid derivative of *P. biflorum*. Seven morphological characters, anther length, pistil length, leaf length, leaf width, perianth length, pubescence and leaf vein number, were examined statistically with discriminant analysis. Anther squash preparations were made from immature buds of *P. biflorum* and *P. canaliculatum*, and examined for chromosome variations. Results from fifty initial specimens indicated pubescence and anther length as the most influential characters in separating the three species. Analysis of variance indicated significant differences among all three species with respect to morphology. Measurement of morphological characters from additional specimens is currently underway to determine if increased sample size will yield the same statistical results. Initial cytological findings encouraged subsequent study of additional anther squash preparations.

BOGITSCH, B. J. Vanderbilt University --
Ultrastructure of the gastrodermis of
Brachycoelium salamandrae.

The digestive tract consists of a foregut region whose lining is cytoarchitecturally similar to the general body tegument. Glands open into the lumen of the foregut via microtubular-supported ducts. The junction between the foregut and the cellular gastrodermis is marked by a prominent desmosome. The apical plasma membranes of the gastrodermal cells are amplified by means of lamellae. The cells display an extensive

rough endoplasmic reticulum, mitochondria, and numerous Golgi complexes. Two types of vesicles are observed. One type displays a homogeneous matrix that appears to be associated with the emitting face of Golgi complexes. A second type is the multivesicular body that displays acid phosphatase activity. This latter organelle is observed at times to be associated with autophagic vacuoles and is believed to be a part of the lysosome system of the gastrodermis. Starvation of the worms results in an increase in the disintegration of gastrodermal cells as well as an increase in the number of autophagic vacuoles in the cytoplasm.

BOOM, BRIAN-M. and SCOTT A. MORI. The
New York Botanical Garden--Falsification
of the buttress-liana hypothesis.

The buttress-liana hypothesis suggests that a positive correlation exists between buttressed tropical trees and reduced liana loads. Buttresses are regarded as physical impediments which cause lianas to waste energy and nutrient reserves and, thereby, decrease the probability of their becoming attached to the trunk. To test this hypothesis χ^2 tests were made on data collected by the point-centered quarter method for 360 trees in coastal rainforest of Bahia, Brazil: four combinations of buttressing and bark texture (1-buttresses/smooth bark, 2-buttresses/rough bark, 3-no buttresses/smooth bark, 4-no buttresses/rough bark) were compared with trunk liana exclusion. Another test (using only categories 1 & 2) was done to examine the notion that smooth bark hinders lianas from climbing up tree trunks. Results of the first test ($\chi^2=3.680$, $.261 < P < .392$, 3 d.f.) do not support the buttress-liana hypothesis; trunk lianas are just as likely to occur on buttressed as non-buttressed trees. Results of the second test ($\chi^2=2.015$, $.083 < P < .157$, 1 d.f.) do not support the idea that smooth bark is selectively advantageous because it hinders lianas. The adaptive significance of buttresses and smooth bark cannot be explained via liana exclusion. Field work was supported by a grant from the World Wildlife Fund-U.S.

BORTONE, S. A.,¹ C. R. GILBERT,² R. E. JENKINS,³ and J. L. OGLESBY.¹ University of West Florida,¹ University of Florida,² and Roanoke College³--Ichthyofaunal cluster analysis of the Western North Atlantic river drainages.

River drainages along the Eastern and Gulf portion of the United States were subjected to cluster analysis based on the presence/absence of their respective native freshwater fish species. The clusters formed indicate and define several major zoogeographic regions as well as the relationships among these drainages and regions. The analysis indicates that several parameters or factors such as latitude, gradient, and area are responsible for the zoogeographic patterns depicted. A comparison is made with other zoogeographic analyses of the region.

BOWERS, FRANK D. University of Wisconsin-Stevens Point--A preliminary report on the bryophyte flora of selected oceanic bogs of the Maritime Provinces of Canada.

Twenty oceanic to near-oceanic bog sites were visited in the Maritime Provinces and collections made of their bryophyte flora in the summer of 1981. A discussion of the Sphagnum species found and a comparison with inland bogs will be made. A total list of bryophyte species will be reviewed. Water samples taken from the sites ranged from a pH of 3.75 to a pH of 4.58 and to date no correlation of species diversity with pH difference among sites has been noted.

Brennan, Michael and James Fralish. Southern Illinois University at Carbondale--A study of site and vegetation relationships in forest communities in the Ozark Plateau of Illinois.

Tree species distribution and biomass were studied in relation to site characteristics in 30 undisturbed stands located in the Illinois Ozark Plateau. Within each stand, species and dbh data were collected from a minimum of three circular 0.04 ha plots. Adaptation and composition index values were generated from vegetal data and related to site environment. CI values for overstory trees and understory seedlings and saplings were compared to identify successional patterns. Pinus echinata was found primarily on the exposed bluffs on the Mississippi River. Quercus stellata and Carya texana occurred on thin soils of west and south slopes, but on deeper soil, Quercus velutina and Quercus alba dominated the stands. Quercus rubra, Fagus grandifolia, Acer saccharum, Liriodendron tulipifera and other mesophytic species dominated north slopes and coves in the absence of disturbance.

LUTHER BROWN and SARA MORSCHES. George Mason University and Mt. Lake Biological Station--Social Organization in a fungus beetle population (*Bolitotherus cornutus* (Coleoptera: Tenebrionidae)).

Forked fungus beetles use the sporophores of polyporoid bracket fungi as oviposition sites, larval and adult food sources, and overwintering places. Male beetles have horns on their pronotum which they use as weapons during aggressive encounters with other males. The presence of horns, together with the limited and defensible nature of critical fungus resources suggests a resource based social organization. Here we report preliminary analyses of field observations on a fungus beetle population located in southwestern Virginia. Beetles comprising this population have been marked each summer since 1979. Frequent behavioral observations of the population were made in 1979, 1980, and intensive observations were continued in 1981. Overwinter survival approached 50% in each year. Variance in the number of times individual males were ob-

served courting was significantly greater than for females, suggesting that these insects are polygamous. Sex ratios in each year were skewed with an excess of females. Frequency of courtship was proportional to horn size, elytra length and weight among males, but was independent of these morphological factors among females. Analyses of home range movements of single beetles indicate that males have extensively overlapping home ranges and do not defend territories. We conclude that social organization is not based on the defense of resources and may involve other mechanisms as female choice of mate or male dominance interactions.

BROWN, RICHARD D. University of North Carolina at Charlotte--Song variation in the Louisiana Waterthrush, *Seiurus motacilla*.

One-hundred ten recordings containing 1,715 songs of 90 individual Louisiana Waterthrushes were studied from 6 states and 1 Canadian province. Songs were separated into normal songs and playback songs. Normal songs contained an average of 9.17 phrases of nearly 7 types. Phrases were classified into 140 categories. Phrase types averaged 1.05 notes each, were sung at a rate of 7.03 per second, and averaged 0.111 second in length. Intervals between songs averaged 9.85 seconds and intervals between phrases averaged 0.079 second. Most Louisiana Waterthrush phrases contained no intervals. Songs were sung at a rate of 5.39 per minute with a broadcast time of 10.99 seconds per minute. Songs averaged 2.02 seconds in length. Phrases were sung between a low frequency average of 3.10 KHz and a high frequency average of 6.27 KHz. Phrases slurred through an average frequency range of 3.17 KHz. Louisiana Waterthrushes responded to playbacks by singing significantly longer songs containing phrase types not found in the normal song. One-hundred thirty phrase types were unique to playback songs. Playback songs averaged 20.06 phrases of over 14 types and were sung at a faster rate (7.24 songs per minute) than normal songs. Louisiana Waterthrushes sing flight songs as defense songs and rarely sing a flight song per se.

CAMBURN, KEITH E. and MELVIN L. WARREN, JR. Kentucky Nature Preserves Commission--The epizoic occurrence of the red alga *Compsopogon coeruleus* on the parasitic copepod *Lernaea* from Kentucky fish.

Compsopogon coeruleus, a freshwater red alga, is widely distributed in the southern United States and is known in Kentucky from Muddy Creek and Mud River, Butler County, and Barren River, Warren County, where it grew attached to submerged limbs and concrete. Specimens of the parasitic copepod Lernaea sp. from fish collected at these three streams were subsequently examined for the presence of Compsopogon coeruleus. A total of 1489 fish representing 47 species from these localities were examined for the presence of Lernaea sp. and attached Compsopogon coeruleus. This alga occurred only on Lernaea sp. from Mud River fish. Of the 692 fish examined from this

stream, 7.9% were infected with Lernaea sp. and 15.3% of these supported growth of Compsopogon coeruleus. Fish infected with Lernaea sp. supporting Compsopogon coeruleus were Notropis atherinoides, Notropis fumeus, Notropis spilopterus, Notropis whipplei, and Pimephales notatus. In addition to this alga, 27.8% of the Lernaea sp. examined supported various densities of epizoid diatoms. This is the first report of the epizoid occurrence of the red alga Compsopogon coeruleus.

CANTRELL, BUDDY. Vanderbilt University--Methodological considerations in a numerical study of the floristic biogeography of the southeastern United States.

In any quantitative, biogeographic study, the selection of operational taxonomic units (OTUs: taxa used as characters) and the delineation of operational geographic units (OGUs: primary areas for which data is collected) must be accomplished with minimal bias and must realize the availability of a suitable data base for the construction of the OGU-by-OTU basic data matrix (BDM). The actual analysis can include any of several data transformations and numerical techniques. Various considerations in the construction of the BDM, its transformation, and the choice of analytic procedure, including a comparative summary of methods (such as phenetic clustering, principal components analysis, reciprocal averaging, the Wagner-tree algorithm, and cladistic methods), will be discussed. Supported in part by National Science Foundation grant SPI-8019192.

CANTRELL, BUDDY. Vanderbilt University--A comparative evaluation of results from several numerical techniques used in a biogeographical study of the southeastern United States.

The complexity and diversity of the flora of the southeastern United States have been reduced subjectively in several studies to general vegetation types or categories. This study attempts to resolve quantitatively more detailed, floristic relationships among areas within the Southeast using the distributions of 85 tree taxa as given in Atlas of United States Trees, Volume 1. The results of analyses will be discussed and compared, including comparisons to earlier studies. Supported in part by National Science Foundation grant SPI-8019192.

CARTER, RICHARD. Vanderbilt University--The Flora of the Delta National Forest.

This bottomland hardwood forest is situated entirely in the alluvial flood-plain of the Mississippi River

at the confluence of the Yazoo and Big Sunflower Rivers in west central Mississippi. 400 species of bryophytes and vascular plants were collected from this approximately 100 square mile area. Plant communities will be correlated with elevation, soil type and frequency of flooding. Additionally, rare and otherwise interesting species collected during the study will be discussed. (This study was supported by the Graduate School of Mississippi State University.)

CARTER, RICHARD. Vanderbilt University--Morphological Relationships Among the Species of Cyperus sect. Umbellati from North America.

Systematic relationships in this large and complex genus are not well understood. The North American species of sect. Umbellati of Cyperus have been treated variously by different authors. Examination of seed, stem and leaf surfaces using SEM, as well as, anatomical study of leaves from throughout the ranges of the species has been done. Considerable anatomical variation exists among the species and will be discussed, as will the results of SEM studies, especially with regard to Cyperus retrofractus and its allies. (Supported in part by Argonne National Laboratory).

CHANG, C.B., M.P. THOMPSON and J.P. HARLEY. Eastern Kentucky University--The Parasites of White-Tailed Deer (Odocoileus virginianus) from Central Kentucky.

Studies on parasites of 39 white-tailed deer were conducted from 1980 - 1981. The following 12 adult helminths and two blood worms were found: Setaria yehi, Gongylonema pulchrum, Trichostrongylus axei, Oesophagostomum venulosum, Parelaphostomum tenuis, Dictyocaulus viviparus, Capillaria sp., Apterasia sp., Ostertagia dikmansii, Ostertagia mossi, Trichostrongylus sp., Haemonchus contortus, microfilariae of Setaria sp., and trypanosomes (epimastigotes). This study resulted in about three times as many major helminths being recovered than were recovered during the autopsies of 20 white-tailed deer in the same study area from 1973-1974.

CLARK, JIM D. University of Kentucky -- Slime mold senescence and lifespan.

The diploid plasmodia of heterothallic isolates of the slime molds Didymium iridis and Physarum polycephalum have been shown to have a determinate lifespan controlled by their genotypes. This abstract extends the report of senescence to a third heterothallic species, Physarum cinereum, and to a number of non-heterothallic species: Physarum pussillum, Physarum compressum and Stemonitis flavogenita. Also five non-heterothallic isolates of Didymium iridis were found to display senescence. However, two isolates, one of Stemonitis flavogenita and one of Physarum gyrosium, did not undergo senescence during this study.

COFFEY, JANICE C. St. Mary's College--What are prophylls, auricles, and ligules? How to use a rush key.

The term prophyll has been used (and misused) in a number of ways by botanists since Turpin, in 1819, first used the word to describe these structures in angiosperms. The term has been largely ignored for dicots and often overemphasized in monocots--to the point of finding prophylls where none exist. The terms bract and bracteole are used in place of and in addition to the prophyll in keys, both correctly and incorrectly. Auricles are often well-defined in rushes and sometimes confluent to form a so-called ligule--a structure usually ignored in keys. Consistent usage of these terms is necessary if generally comprehensible keys to rushes are to be made.

COFIE, NATHAN and ARTHUR L. WILLIAMS. University of Kentucky--Molecular Regulation of the ilv Gene Cluster of Escherichia coli K-12.

In this study, the isoleucine and valine (ilv) enzymes were examined in an E. coli lambda lysogen and in several valine-resistant and temperature-resistant derivatives. Enzyme levels were measured in these strains to determine the presence of regulatory regions. The ilvA gene product (threonine deaminase) appeared to be altered under both repressed and derepressed conditions in the val^r strain, thereby exhibiting a structural alteration of the gene. During a prolonged derepressing condition, the cured strain (temperature resistant) ilvA gene product was elevated higher than the wild type or val^r enzyme. Growth of these strains was rapid in the val^r derivative and slowest in the cured strain. However, the cured strain exhibited the highest specific activity than the other strains in both the crude and purified extracts. Kinetic studies confirmed further the structural alteration of the ilvA gene product in these derivatives. Transduction experiments using a lysate prepared from the original lambda lysogen, indicated that the genetic markers rep, rho, cya and rbs were probably carried on the phage along with the ilv genes. Additional experimentation such as DNA/RNA hybridization should provide more insights as to the overall genetic regulation of the ilv gene cluster. Further evidence for a common regulatory element will be discussed. [Supported by NIH Biomedical Grant]

COILE, NANCY C. and SAMUEL B. JONES, JR. University of Georgia--Systematics of Lychnophora Mart. (Compositae:Vernonieae). Lychnophora, a genus endemic to the Brazilian Planalto, consists of eleven species of shrubs. The remarkable adaptations of these plants to fire and xeric habitats will be discussed, along with their speciation patterns in a rather limited geographical area. Habitat, habit and morphological variation will be highlighted.

COMEAX, BARRY L. North Carolina State University--Taxonomic Studies on the Native Grapes of North Carolina.

The native grapes of North Carolina include Vitis aestivalis Michaux, V. aestivalis var. argenteifolia (Munson) Fernald, V. vulpina Linnaeus, V. labrusca Linnaeus, V. baileyana Munson and V. rotundifolia Michaux. In addition to these species a large group of Euvitis populations are found in the coastal plain which are reproductively isolated from the above species. All Euvitis species found in North Carolina appear to remain reproductively isolated in nature by prezygotic barriers such bloom date and ecological niche. The geographical and ecological distributions of these species are being studied. Experimental hybrids between these species are being made to compare with any possible native vines suspected to be of hybrid origin.

COOPER, CHARLES M.¹ and JERRY C. RITCHIE.² USDA, Agricultural Research, Sedimentation Laboratory, Oxford, Mississippi¹ and USDA, Agricultural Research, National Program Staff, Beltsville, Maryland²--Net Plankton from Lake Chicot, Arkansas, a sediment-limited ecosystem.

Primary productivity-sediment interaction studies in Lake Chicot, Arkansas, July, 1976 through July, 1981 revealed 96 genera of net plankton. Fifty-seven genera of phytoplankton were identified from this Mississippi River oxbow lake. Chlorophyta (25 genera), Chrysophyta (14 genera) and Cyanophyta (10 genera) were major contributors. Dominance depended upon seasonal succession. Rotifera (23 genera) and Protozoa (10 genera) constituted the majority of the zooplankton, both in genera and numbers. Greatest diversity occurred in summer, coinciding with major primary productivity peaks. Plankton diversity was limited by sediments in the main lake basin. However, after sediment levels declined in summer, diversity approached that of the isolated relatively clear upper basin of the lake.

CRIDLEBAUGH, PATRICIA A. University of Tennessee--Macrofossil and pollen evidence for paleoenvironmental change in the lower Little Tennessee River Valley, East Tennessee.

Analysis of paleobotanical remains from archaeological sites in the Ridge and Valley Province of East Tennessee has resulted in the identification of many plant taxa utilized by Indians from 10,000 B.P. to recent times. Frequency distributions of carbonized wood, nutshell, and seed material tabulated by plant taxon and plant habitat document that for the 1700 years prior to Euro-American settlement Indians practiced specific strategies for exploitation of plants within bottomlands, lower mesic terraces, higher xeric terraces, and bedrock uplands. A pollen core (210 cm in length) from Tuskegee Pond, situated on an abandoned river terrace, dates back to circa A.D. 1800. Pollen data complement the macrofossil evidence indicating long-term exploitation and disturbance of the local ecosystems in response to environmental stress imposed by human activities.

CURRENT, WILLIAM L., and NORMAN C. REESE, Auburn University.--Endogenous development of calf cryptosporidia in suckling mice.

Three-day-old white mice were inoculated with oocysts of Cryptosporidium sp. isolated from a calf. Two mice were necropsied every 24 hr from day one through 8 post inoculation (PI). Portions of upper, middle, and lower small intestine; cecum; and colon of each mouse were obtained and processed for light and transmission electron microscopy. One- μ m-thick plastic sections of the ileum of mice necropsied on days 3 through 8 PI revealed numerous endogenous stages in the brush border. No parasites were seen in sections of the ileum on day one PI. A moderate number of trophozoites and immature schizonts were seen on day 2 PI. Mature schizonts observed in tissues obtained day 3 PI had 8 merozoites. Mature schizonts in tissues obtained day 4 PI had 8 or 6 merozoites. Mature schizonts from day 5 PI had 8, 6, or 4 merozoites. Mature schizonts from days 6 through 8 PI had 6 or 4 merozoites. Sexual stages (macrogametocytes) were present in sections of the ileum on days 6 through 8 PI. Transmission electron microscopy (TEM) revealed that all endogenous stages were in a parasitophorous vacuole within modified microvilli. Schizonts and macro- and microgametocytes could be distinguished by TEM. Ultrastructure of endogenous stages of the calf isolate of Cryptosporidium sp will be compared with that of human isolate.

DAVENPORT, L. J. University of Alabama--Seed morphology in Hydroleia (Hydrophylaceae) and its taxonomic significance. Under scanning electron microscopy, testae of seeds of Hydroleia species were found to fall into two main groups: 1) those having fairly uniform reticulations and lacking ornamentation at the reticulation joints; and 2) those having narrowed reticulations and pronounced ornamentation at the joints. Seeds of species falling into the second group can be further divided into those having papule-like ornamentation and those having circular or "doughnut"-like ornamentation. At the generic level, seed coat morphology adds further evidence for the distinctness of Hydroleia and its close relative, Nama. At the subgeneric level, the failure of seed morphology to follow sectional lines accentuates the arbitrary nature of the established sections. At the species level, the study of seed morphology allows the identification of the historically confusing taxon, Sagonea palustris, and points to necessary changes in nomenclature.

DAVIDSON, JEAN L. University of Tennessee--Paleoecological analysis of Holocene vegetation, Lake in the Woods, Cades Cove, Great Smoky Mountains National Park.

The Blue Ridge Mountains have areas with divergent bedrock and topography which have served as refugia for some species during times of climatic stress. Cades Cove, a limestone fenster, contains poorly drained bottomlands. Lake in the Woods is a semi-permanent woodland hollow pond within a previously drained swamp which once

covered the west end of Cades Cove. Using pollen and macrofossil analysis of a sediment core from the site, the local and extralocal vegetation of the lake has been determined. Radiocarbon analysis of the core at 25-35 cm and 65-75 cm provides dates of 6300 $\pm$ 90 B.P. and 6410 $\pm$ 70 B.P. These dates reflect rapid sedimentation rates which permit detailed resolution of the mid-Holocene vegetation of Cades Cove. Pollen from the 75 cm level indicates the presence of a bottomland swamp of Salix, Nyssa, Acer rubrum, and Liquidambar with an understory of Isoetes and wetland fern species. Sweetgum was previously considered absent in the Blue Ridge prior to settlement. The extralocal vegetation consisted primarily of Quercus and included Castanea. Upland hardwood vegetation today has been modified with the introduction of Pinus and the extinction of Castanea. The presence of perennial herbs including Thalictrum represents a semi-permanent wetland habitat. In addition to reconstructing Holocene vegetational history, these paleoecological analyses permit climatic inducements of vegetation change to be inferred, and also allow speculation on the role of cove swamps as refugia during Holocene periods of climatic stress.

DELCOURT, HAZEL R.,¹ PAUL A. DELCOURT,¹ and THOMPSON WEBB III,² University of Tennessee¹ and Brown University²--Dynamic plant ecology: lessons from the past, implications for the future.

Ecologists tend to assume that plant succession occurs under equilibrium conditions, with constant climate, stable flora, and minimal rates of evolution. However, vegetational processes and patterns vary on all spatial and temporal scales, reflecting not only modern biological and environmental factors but also the history of environmental changes. The micro-scale (1 to 5 x 10³ years, 1 to 10⁶ m²) and macro-scale (5 x 10³ to 10⁶ years, 10⁶ to 10¹² m²) of resolution encompass the space-time domains most important to ecologists and Quaternary paleoecologists. Climatic change has been relatively gradual over the past 10³ to 10⁶ years. These Quaternary climatic oscillations have resulted in significant shifts in species ranges and changes in species dominance within vegetation types. Knowledge of past vegetational changes resulting from Quaternary climatic change can be extended to predict future biotic response to man-induced environmental perturbations. Anthropogenic modifications of the global environment may accelerate the rate of climatic change in the near future. Rapid climatic change over the next 10² years may result in vegetational disequilibrium, with an increase in turnover rate in species composition, changes in local and regional patterns in dominance and diversity, displacement of species ranges, and local extinction of populations.

DELCOURT, PAUL A., and HAZEL R. DELCOURT. University of Tennessee--Mapping and calibration of pollen and forest dominance for tree species in the Southeast.

Through FORMAP (N.S.F. sponsored project

"Forest mapping across eastern North America from 20,000 YR BP to the present"), we are examining the quantitative relationship of arboreal pollen to modern forest composition in eastern North America. We have collected samples of modern pollen rain from lakes, swamps, forest openings, and fields in one-degree areal blocks for the region south of 37° N latitude and east of 95° W longitude. Using county-level inventories of forest composition from the U.S.D.A. Forest Service, we have generated paired percentage maps for major tree species within the Southeast. For each plant taxon, contoured maps are presented for both percent of pollen abundance (based upon the total sum of arboreal pollen in each sample) and percent dominance of its populations within the forest (based upon total growing-stock volume of wood within each county). The distributional patterns in pollen and extant forests illustrate excellent correspondence and reflect changes in physiography as well as gradients in temperature and precipitation across the region. Modern pollen/vegetation calibrations provide an objective basis for translating fossil pollen spectra into quantitative records of past vegetation.

DEL PORTILLO, HERNANDO A. and RONALD V. DIMOCK, JR. Wake Forest University--The chemical induction of negative phototaxis of the symbiotic water mite *Unionicola formosa*.

The sign of phototaxis of the symbiotic water mite *Unionicola formosa* is specifically reversed from positive to negative upon exposure of this mite to the chemical influence of its molluscan host, the mussel *Anodonta imbecilis*. The negative photobehavior can be induced by either water from the host's mantle cavity or an homogenate of host mantle tissue. The active component of mantle homogenate is retained during ultrafiltration (molecular weight exclusion of 10,000 daltons), is labile at 80 and 100°C, and is sensitive to treatment with trypsin. Elution of mantle homogenate from DEAE cellulose and fractionation by gel chromatography indicate that the active fraction is acidic in nature and of approximately 10⁵ daltons. These results suggest that the host-induced negative phototaxis of *U. formosa* is mediated by a protein.

DICKINSON, PATSY and FRÉDÉRIC NAGY. University of Kentucky and Laboratoire de Neurobiologie Comparée--Neuronal modulation of a rhythmic behavior in rock lobsters.

Movements of the pylorus, responsible for filtering food in the stomach of the rock lobster, *Jasus lalandii*, are controlled by a network of 14 neurons, which produce alternating bursts of action potentials in motor neurons controlling dilation and contraction. Using intracellular recording techniques, we have identified an interneuron whose activity can modify the output of the pyloric rhythm, shifting it from a slow, irregular pattern to a higher frequency, more regular pattern. Activity in this modulatory interneuron (called the anterior pyloric modulator, APM) results not only in increased frequency of bursts

but also in enhanced bursting in the individual neurons of the pyloric network. Impulse frequency within bursts and the amplitude of the membrane potential oscillations underlying bursts increase under the influence of activity in APM. These changes can all be explained by an enhancement of the abilities of the pyloric neurons to produce regenerative slow changes in membrane potential, or plateau potentials. Such an augmenting of the ability to generate plateau potentials is one mechanism by which neuronal modulations may be effected. (Supported by the National Science Foundation, the Centre National de la Recherche Scientifique and the DGRST.)

DODD, C. KENNETH, JR. U.S. Fish and Wildlife Service--Nesting of the green turtle, *Chelonia mydas*, in Florida - A hopeful trend?

Except for accounts of Audubon and Brice in the 1800's, reliable records of the nesting of the green turtle, *Chelonia mydas*, do not occur in the literature. Even these accounts focus on populations in the Keys and the Cape Sable region. Beginning with the report of two nests in 1959, the number of nests recorded in Florida has steadily increased; at least 366 nests were confirmed in 1980. The majority of nests occurred from Merritt Island south to Key Biscayne, most of which were layed on relatively undisturbed beaches. Five reasons can be advanced for this apparent increase: increased surveillance of nesting beaches, increased awareness of sea turtles and their problems, protective legislation, the success of a head-starting program located on Hutchinson Island, and the possibility that some turtles are immigrating from populations further south. While better surveillance and public awareness may be responsible for perception of an increasing turtle population, it is likely that the increase is real and has resulted from a combination of the latter three reasons. A review of the level of historical green turtle nesting, as well as a year by year record of nesting since 1959, will be provided.

DOLIN, PAMELA S. and DONALD C. TARTER. Marshall University--The life history and ecology of *Chauliodes rastricornis* Rambur and *C. pectinicornis* (Linnaeus) (Megaloptera: Corydalidae) in Greenbottom Swamp, Cabell County, West Virginia.

Life history and ecology studies of the fishflies *Chauliodes rastricornis* Rambur and *C. pectinicornis* (Linnaeus) were investigated from March 1978 until September 1980 at Greenbottom Swamp, Cabell County, West Virginia. Head width-frequency histograms indicated that the life cycles of both species are univoltine. Larval *Chauliodes rastricornis* showed the greatest growth (66%) between June and October, while *C. pectinicornis* had two growth periods from July to October (106%) and from April until June (17%). Both species of larval *Chauliodes* ingested organic detritus, copepods, and algae during the winter months.

Ostracods, rotifers, cladocerans, and immature insects were consumed during the warmer seasons. Chauliodes rastricornis pupated from April to May with a mean of 12 days and emerged at dusk from May to June; peak emergence was on May 9. Chauliodes pectinicornis pupated in June and emerged at night during July. The chi-square test showed a significant difference (0.05 level) from the 1:1 sex ratio in adults of C. rastricornis. Total egg counts ranged from 922 to 1612 ($\bar{X} = 1166$) and 967 to 1500 ($\bar{X} = 1250$) eggs per female in C. rastricornis and C. pectinicornis, respectively.

DORSETT, DEBORA R. AND DAVID C. HEINS. Millsaps College -- Reproduction of the blacktail shiner, *Notropis venustus* (Girard), in southeastern Mississippi.

The reproductive biology of the blacktail shiner, *Notropis venustus* (Girard), was studied using collections taken from the Jourdan River drainage system, Hancock County, Mississippi. We will report on the reproductive period, fecundity and size of mature ova in *Notropis venustus*.

DRISCOLL, COLLEEN. Wake Forest University--The behavior and physiology of the leech, *Placobdella parasitica*, as they relate to the basking habit of turtles.

The purpose of the basking habit of turtles is primarily for thermoregulation. However, it has been proposed that basking might also serve to eliminate ectoparasites such as leeches. The present study investigated the behavioral and physiological responses of *P. parasitica* to changes in humidity, light, and temperature experienced as its turtle host emerged from water and began to bask. Physiological studies and behavioral observations during controlled basking experiments indicated that the decrease in humidity and increases in light intensity and temperature were within the tolerance range of *P. parasitica* and did not induce leeches to leave their hosts. Dehydration experiments showed that 50% mortality occurred when leeches lost over 62% of their original wet weight ($n=60$). Leeches on basking turtles had a mean weight loss of 10.5% of their original wet weight ($n=17$). Phototaxis experiments, in air, showed that the response of *P. parasitica* to a high light intensity ($6.52 \times 10^{-5} \text{ W/cm}^2$) was not significantly different from its response to total darkness ($p < 0.001$).

DUNN, DEBRA C. and RONALD V. DIMOCK, JR. Wake Forest University--Mechanisms of intraspecific mucous trail following by the mud snail *Ilyanassa obsoleta*.

The ability to follow the mucous trails of conspecifics has been shown for various aquatic and terrestrial gastropods. The trail mucus of the marine mud snail *Ilyanassa obsoleta* has been partially characterized in an effort to determine the mechanisms involved in trail following behavior. Snails do not respond to trails that have been heated at 80°C for 30 minutes; however,

trails subjected to milder heat-treatment (60°C for 30 minutes) continue to elicit trail following. Treatments of mucous trails with the nonspecific protease, Pronase, does not affect trail following behavior. Trails treated with hyaluronidase are aversive to the snails. The trail mucus has been shown to be antigenic, and immunological methods are being employed to further characterize the mucus.

DUPRE, R. KEITH, E.C. CRAWFORD, and JOHN J. JUST. University of Kentucky--Shifts in cutaneous thermal sensitivity during metamorphosis of *Rana catesbeiana* tadpoles.

The preferred body temperature of *Rana catesbeiana* tadpoles is reported to shift to warmer temperatures from spring to summer (Lucas & Reynolds, *Physiol. Zool.* 40:159, 1967). It is possible that this seasonal shift results from developmental changes in thermal responsiveness which can be related to metamorphic stage. We have determined the thermal sensitivity of temperature sensitive neurons in the dorsal skin of bullfrog tadpoles from Taylor-Kollros stages X to XXV. Tadpoles were seined from local ponds and maintained at 23°C for at least 2 weeks on a constant 14:10 light-dark cycle. Animals were decapitated and the dorsal skin removed with intact dorsocutaneous nerves. The isolated nerve-skin preparation was secured atop a Peltier thermode, and action potentials of neurons were recorded with suction electrodes. The static response of temperature sensitive cutaneous receptors was determined over a range of 10 to 35°C. The skin temperature at which maximum impulse frequency occurred increased from about 15°C at stage X to 27°C at stage XXV. These data suggest that temperature sensitive cutaneous receptors may be important in establishing preferred body temperature at different metamorphic stages.

EDWARDS, DAVID F., R. R. MILLS and T. DANIEL KIMBROUGH. Virginia Commonwealth University--The effects of selected biogenic amines on intestinal motility in the cockroach.

In earlier studies, a baseline of contractile events, both in the full and empty gut excised from *Periplaneta americana* was established using a standard physiological saline for insects. Recently, intestinal contractility has been observed using *Gromphadorhina portentosa*, the "hissing" cockroach. This has made possible the development of a sensitive tissue marker to a number of bioactive substances being measured. Among the agents that have been tested are acetylcholine, norepinephrine and serotonin. It is interesting to report that unlike that of the mammalian system, intestinal motility in the cockroach is enhanced in every case following the introduction of the drugs named above to the perfusate.

EDWARDS, ROBERT W. University of North Carolina--Cellular interactions in the immune response of mice infected with *Nippostrongylus brasiliensis*.

The major components of the cell-mediated immune response related to the final expulsion of the nematode, *Nippostrongylus brasiliensis*, in mice were investigated. A high degree of protection was afforded animals that received whole lymphocyte suspensions from actively immunized donors. C3H mice that received thymus-derived lymphocytes, (T-cells), from actively immunized donors showed a slight reduction in total worm burden, whereas Swiss-Webster mice that received similar treatment did not exhibit a significant reduction in worm burden. Mice that received lymphocytes and subpopulations of lymphocytes, (T- and B-cells), as well as those that received bone marrow-derived lymphocytes, (B-cells), from naive donors did not exhibit a significant reduction in total worm burden. No statistical difference in total worm burdens could be directly associated with the transfer of peritoneal phagocytes (macrophages) from either sensitized or naive donors.

EDWARDS, ROBERT W. AND JOHN R. SEED. University of North Carolina--Population density of *Trypanosoma brucei gambiense* in two different anatomical compartments of the mouse.

The effects of environmental conditions in different anatomical compartments on the survival rate of *Trypanosoma brucei gambiense* have been investigated. Preliminary studies on mice with established Ehrlich's ascites tumors, infected intraperitoneally with trypanosomes, showed a 1000-fold reduction in the number of trypanosomes in the peritoneal exudate as compared to those in the blood at peak parasitemia. The results are considered to be the first evidence to support the hypothesis of two environmentally different anatomical chambers. It also reinforces the theory that trypanosomes occurring in the two compartments, or the compartments themselves are physiologically different. Thus, these compartments might be better delineated by determining the extent of depletion of critical/essential substances by the cells within the compartment, i.e., amino acids, carbohydrates, etc., or by demonstration of the production of inhibitory substances within the compartment, i.e., catabolic parasite products, proteases, etc. Preliminary results show no difference in the percent of dividing forms in the two compartments, but do support the hypothesis of key nutrient depletion. We are currently trying to distinguish whether or not this compartment phenomenon is host or parasite mediated. The development of this model will lead to significant increases in the understanding of African trypanosome ecology in vivo.

ERNST, JOHN V.,¹ WILLIAM L. CURRENT,² and GERALD W. BENZ.² USDA-AR¹ and Auburn University.²--The sexual stages of *Eimeria wyomingensis* in experimentally infected calves.

Twelve calves 2 to 4 weeks old were each inoculated orally with one million sporu-

lated oocysts of *Eimeria wyomingensis* and necropsied at 24 hr. intervals from 12 to 17 days post inoculation (PI). Histologic sections of intestinal tissues obtained from 5 of the calves contained sexual stages of *E. wyomingensis*. The sexual stages ranged from young gamonts present at 12 days PI to oocysts present at 16 to 17 days PI. The parasites were located within cells in the lamina propria of the lower 5 meters of the small intestine. Host cells were large, contained an eosinophilic cytoplasm and a large nucleus with one to several nucleoli. Some host cells had two nuclei. Only one type of wall-forming body could be distinguished in mature macrogametocytes. However, the oocyst wall was composed of 2 layers. The microgametocyte was larger than the macrogametocyte and had a polycentric type of development.

ETGES, DAVID J. AND B. J. BOGITSCH.

Vanderbilt University -- The effect of colchicine on [³H] proline incorporation in *Hymenolepis diminuta*

Sections of adult *Hymenolepis diminuta* were incubated in colchicine to determine its effect on incorporation of [³H] proline into the tegument. Following incubation in colchicine, the worms were pulsed for various lengths of time in [³H] proline and chased with cold proline. Statistical evaluation of autoradiographs revealed a significant decrease in amount of incorporated label in the distal tegument in colchicine-treated tissue. The distribution of tegumental alkaline phosphatase was similarly diminished in colchicine-treated worms. These results will be discussed in light of what is known concerning the function of the various regions of the tegument and its maintenance.

EVANS, DAN K. Marshall University--Biosystematics of *Carex* Section *Squarrosae*.

Carex Section *Squarrosae*, widespread in eastern North America, is comprised of *C. frankii* Kunth, *C. squarrosa* L. and *C. frankii* Michx. Three geographical populations (Appalachia, Carolina and Midwest) of each species were analyzed by discriminant analysis using 14 morphological characters. This analysis showed little separation between intraspecific populations but strong separation between sympatric species. Chromosome counts show a close relationship between *C. typhina* (2n=54) and *C. squarrosa* (2n=56) with *C. frankii* (2n=36) being least related. However, evidence from discriminant analysis of anatomical characters suggests that *C. typhina* is more anatomically related to *C. frankii* than to its morphological and cytological ally, *C. squarrosa*.

FARMER, JANIS M. and C. RITCHIE BELL. University of North Carolina at Chapel Hill--Population differences in germination of *Asclepias syriaca* L. seeds. Seeds from 21 populations of *Asclepias syriaca* L. from localities in five states were germinated on different soils and at different temperatures to determine if

populational differences exist in seed germination and viability. All pods from no less than 8 separate stalks per population were collected; the seeds from each pod were counted, weighed and then bulked. Samples of 750 seeds per population were stratified in water at 5C for one week, after which 25 seeds from each set were placed in petri dishes containing one of six substrate types. Two plates per population were placed in a dark constant 30C growth chamber and two in a dark alternating 20-30C growth chamber. One plate per population was placed in a dark constant 25C growth chamber. Moisture in the petri plates was maintained at field capacity. Plates were checked for the number of seeds germinated every third day for fifteen days. Results indicate neither substrate nor seed size had any noticeable effect on the germination response. Temperature, coupled with individual populational differences, appear to be major factors influencing germination with maximum germination equaling 96% for a population maintained in alternating temperatures on a peat-clay substrate.

FERRELL, BLAINE R. Western Kentucky University--The effects of photoperiod-temperature interactions on testicular recrudescence and fattening in the green anole, Anolis carolinensis.

An interrupted night experiment was carried out in anoles during a four week period beginning October 8, 1980 in order to explore the possibility that testicular growth in response to photoperiod involves a temperature dependent daily rhythm of testicular photosensitivity. A daily variation in testicular growth responsiveness to nightly light-pulse treatments was observed in anoles held at 30°C in LD 10:14 whereas no time dependent variation in testicular photosensitivity was evident in anoles held at 20°C in LD 10:14. From these data it appears that photoperiod entrains a daily rhythm of testicular photosensitivity and that the expression of this rhythm is temperature dependent. No differences were observed among paired fat body weights in response to timed nightly light-pulse treatments at either acclimation temperature. These results indicate that fat stores and testicular development are regulated by separate physiological mechanisms.

FINSTROM, MATTHEW F. Knoxville Zoological Park--An unusual defensive display in a nest guarding Malayan pit viper.

Nest guarding by females is known to occur in most if not all species of oviparous pit vipers. However, detailed observations have rarely been documented. The present paper reports on intensive observations on a type of nesting behavior hitherto undescribed for any species of snake. On July 22, 1981, a Malayan pit viper layed 16 eggs and was allowed to remain with them until hatching, 43-46 days later. When the hatching

began, the mother pushed away any approaching objects that made body contact with a loop of her body. Although usually very aggressive, the snake could not be induced to strike. This behavior was seen with objects as diverse as a snakehook, mice, rats, and her own hatchlings. All objects were pushed away regardless of size or direction of approach. Inhibition of the primary defense mode in favor of a secondary mode is suggested. The adaptive significance of this type of defensive display will be discussed.

FOSTER, LEWIS A. AND B. J. BOGITSCH. Vanderbilt University -- Red blood cell usage by Schistosoma mansoni schistosomules in vitro.

Red blood cells labeled with [2,3-³H]-aminolae-vulinic acid or [4,5-³H]-leucine in vitro were fed to Schistosoma mansoni schistosomules collected after skin penetration and cultured in vitro. Label is detected within the worms using autoradiographic techniques and within a TCA precipitable fraction from worm homogenates. Schistosomules and adult worms incubated in the presence of free radionuclide display similar incorporation. Incorporation of the labels is significantly reduced in the presence of puromycin, albeit more so with leucine than aminolae-vulinic acid. Analysis by SDS gel electrophoresis of the homogenates of schistosomules labeled with each radionuclide will be discussed.

FRAZER, NAT B. University of Georgia--The survival rate of juvenile loggerhead sea turtles (Caretta caretta) necessary to maintain a stable population size.

Survival rates are unknown for juvenile sea turtles in the wild. However, the rate of juvenile survival, J, may be estimated from data on the survival and fecundity of adult females as follows:

$$J = \frac{1}{\sum_{x=\alpha}^{\omega} q_x m_x}$$

where α and ω are the ages at first and last reproduction, m_x is the fecundity at age x , and q_x is the probability that a turtle of age x will live until age $x+1$, given that she has attained adulthood (analogous to l_x for adult turtles, discounting the years x prior to adulthood). Data collected at Little Cumberland Island, GA from 1964 to 1980 were used to establish adult survivorship and fecundity. At present rates of adult survivorship and fecundity 4 per thousand must survive to adulthood in order to maintain a stable population size, assuming a hatching success rate of 75%.

FREDERICK, L. and FITZ PATRICK RIGBY.

Howard University--Myxomycetes from Bark of Australian and New Zealand Trees.
A visit to Australia and New Zealand, in connection with the 13th International Botanical Congress, provided an opportunity for the collection of bark samples from several gen-

era of trees in both countries in order to study bark-inhabiting myxomycetes from that part of the world. The moist chamber technique was used to induce the development of slime mold fructifications. The Australian collection represented multiple bark samples from 18 collections taken from 8 genera and 14 species of trees. The New Zealand collection represented multiple bark samples from 23 collections taken from 17 genera and 19 species of trees. Within 6 to 8 weeks after specimens were collected slime mold sporophores appeared in moist chambers on 16 of the 23 New Zealand collections and 12 of the 18 collections from Australia. The Australian bark samples have produced nine genera and 11 or more species of slime molds. The genera identified are Arcyria (2 species), Comatricha (2 or 3 species), Cribraria (1 species), Echinostelium (1 or 2 species), Licea (1 species), and Trichia (1 species). Three genera are unidentified. The New Zealand bark samples have produced 7 genera and 9 species of slime molds. Four of the genera found in the Australian collection, viz., Arcyria, Comatricha, Cribraria, and Echinostelium, were present in the New Zealand collection. Physarum and two other unidentified genera have also appeared in the New Zealand collection. Comatricha acanthodes, a Cribraria resembling C. minutissima, and Echinostelium minutum were the most commonly occurring slime mold species in bark samples from both countries. Several of the species found represent new records from this geographical region.

GIBBONS, J. WHITFIELD. Savannah River Ecology Laboratory--Survivorship and longevity of long-lived vertebrates: How long do turtles live?

A 15-year study of marked individuals in populations of freshwater turtles in South Carolina has resulted in mortality and survivorship data for several species. The long-term studies permit the determination of survivorship curves and maximum longevity at levels of precision that are ordinarily not possible in research on natural populations of animals.

GLADDEN, J. B., K. W. KLEINER, C. A. McCAFFREY, and R. R. SHARITZ. Savannah River Ecology Laboratory--Vegetation recovery and zonation along a disturbed southeastern coastal plain stream.

Herbaceous and woody floodplain plant species composition was studied along the length of Steel Creek on the Savannah River Plant, Aiken, SC. Steel Creek received thermal effluents from the early 1950's through 1968 and has been relatively undisturbed for fourteen years. Low altitude color infrared photography and ground level sampling were used to identify nine vegetation types containing 43 herbaceous and 27 shrub and tree species. Species composition of both components shows a clear pattern of species replacement moving from headwater regions toward the river swamp with few species abundant throughout the system. Plant community changes along the stream corridor are believed to reflect changes in flooding frequency and floodplain soil structure as the stream flows from upland plateau to river swamp physiographic regions.

CRANATH, JR. WILLARD O. and C. W. ESCH. Wake Forest University--Regulation of mosquitofish populations by Bothriocephalus acheilognathi (Pseudophyllidae) in a predator-free lake.

Theoretical models describing regulation of host populations by parasites infer that parasite-induced mortality occurs frequently enough to be a significant regulatory force in nature. However, empirical data supporting such a contention are virtually non-existent. Studies conducted over the past two years on the population biology of the mosquitofish, Cambusia affinis, and the pseudophyllidean tapeworm, Bothriocephalus acheilognathi, we believe offer substantive evidence for significant regulatory interaction for this host-parasite system. Since the spring of 1980, various aspects of the population biology of C. affinis have been examined in Belews Lake, N.C. which is devoid of piscine predators, and in adjacent Charlie's Pond which has predaceous fish. Belews Lake mosquitofish are parasitized by B. acheilognathi while those in Charlie's Pond are not. A comparison of sex ratios and mean length of C. affinis in these two populations shows no significant differences. These observations are contrary to results obtained by Krumholz (1963) who found that Cambusia manni in predator-free habitats had a sex ratio of 1:1 and were significantly larger than C. manni in a habitat where predators were known to occur. Lab studies indicate that B. acheilognathi can induce host mortality and that, moreover, such mortality is size-related with smaller hosts being more vulnerable. Interestingly, since male G. affinis do not grow after reaching sexual maturity and females continue to grow until death, male C. affinis may be more susceptible to parasite-induced mortality. Therefore, we suggest that B. acheilognathi is operating to regulate the population dynamics of mosquitofish in the predator-free system.

CRANT, WILLIAM C.,¹ JACOB S. HANKER,² BEVERLY L. GIAMMARA,³ DAVID CARIPPA,³ and FREDERICK H. WHITTAKER.¹ North Carolina State University,¹ University of North Carolina,² and University of Louisville--Peroxidase methods for differentiating eosinophils from heterophils.

Differentiation of eosinophils from neutrophils with a Wright stain is very difficult in the rabbit and may present a problem in the guinea pig. Two new cytochemical procedures for demonstrating peroxidases in haemic cells were evaluated for this purpose in man, the rabbit, guinea pig, rat, and mouse. With both of these staining procedures, eosinophils were much more conspicuous than neutrophils. The first procedure which employs 3,3'-diaminobenzidine (DAB) substrate, copper nitrate intensification, and a counterstain showed a cyanide-resistant eosinophil peroxidase and cyanide-sensitive neutrophil myeloperoxidase. It was found useful in estimating levels of myeloperoxidase activity on storage and between different species. The second procedure, which employs p-phenylenediamine-pyrocatechol substrate and a counterstain, showed a cyanide-sensitive eosinophil peroxidase and no neutrophil enzyme. Both methods were useful for finding eosinophils in stored samples after neutrophil myeloperoxi-

dase was no longer evident. These peroxidase methods were found especially useful in demonstrating an increase in eosinophils in situations where relatively small numbers of eosinophils are involved, e.g., the increase of eosinophils observed in guinea pigs infected with *Pelodera strongyloides*. Supported by U.S.P.H. S. Grants DE 02668, CA 11265, and RR 05333.

GRANT, WILLIAM C.,¹ JACOB S. HANKER,² NORMAN F. WEATHERLY,² GROVER C. MILLER,¹ and BEVERLY L. GIAMMARA³. North Carolina State University,¹ University of North Carolina,² and University of Louisville³—Peroxidases in schistosome egg granuloma.

Chronic stages of schistosome infections are characterized by granuloma development around eggs trapped in the tissues. Histochemical methods developed in our laboratory for the demonstration of peroxidases in hemic cells in various chronic inflammations have been extended to the study of schistosome egg granuloma, an excellent model for the study of hypersensitivity. Mice infected with *Schistosoma mansoni* twenty weeks and reexposed to cercariae were sacrificed six weeks after the second exposure, and the livers were excised and fixed. Two new cytochemical procedures for demonstrating granulocyte peroxidases were used. The first procedure, employing 3,3'-diaminobenzidine (DAB) substrate and copper nitrate intensification, showed a cyanide-resistant eosinophil peroxidase and a cyanide-sensitive neutrophil myeloperoxidase as well as erythrocytes. The second procedure, employing p-phenylenediamine/pyrocatechol substrate, showed only a cyanide-sensitive eosinophil peroxidase. The two different eosinophil peroxidases revealed by these methods may have distinct roles in inflammation.

Eosinophils were very prominent in the granulomata and were observed frequently in contact with egg shells which often showed damage. Granules were occasionally found overlying egg capsules. The cyanide-sensitive eosinophil peroxidase is particularly useful in differentiating eosinophils from heterophils and aids in demarcating granulomata in schistosome infection. Supported by U.S.P.H.S. Grants DE 02668, CA 11265, and RR 05333.

GREENE, JUDITH L., GARY B. MORAN, and J. WHITFIELD GIBBONS. Savannah River Ecology Laboratory--Behavioral responses of freshwater turtles to drought.

Parts of the southeastern United States have experienced severe drought conditions for the past two years. This has resulted in the drying of many temporary and semi-permanent aquatic habitats. This study considers how five species of freshwater turtles from two Carolina bays on the Savannah River Plant have responded to drought conditions. The two bays differ in size and permanence. One, Rainbow Bay, covers less than 3 hectares and has dried up every year since 1978, when our data collection at that site began. The other, Ellenton Bay, covers an area as large as 10 ha when full and has dried up only

twice since the mid-1960's. The turtle populations in Ellenton Bay have been studied intensely since 1967, so a large data base (>12,000 captures) exists for comparison. Disruptions in nesting, emigration, and immigration are discussed.

GRINDSTAFF, STEVE and JERRY L. WEST. Western Carolina University--Relationships between hatching and emergence success of brook trout and trout biomass with suspended solids and intragravel characteristics in a heavily silted and a relatively unsilted Western North Carolina stream.

To determine the effects of siltation on southern Appalachian trout streams, brook trout (*Salvelinus fontinalis*) embryos were planted in two western North Carolina streams; one heavily silted and one relatively unsilted. Intragravel characteristics and suspended solids were monitored. Regression analysis indicated that the percentage of embryos to hatch was correlated positively with mean intragravel dissolved oxygen ($r=.78$) and negatively with mean suspended solids ($r=-.94$) and mean percent of the substrate less than 2mm ($r=-.72$). The percentage of embryos to emerge was also negatively correlated with mean suspended solids ($r=-.79$) and mean percent of the substrate less than 2mm ($r=-.78$) but these relationships were not significant. Mean trout biomass was related inversely with mean suspended solids ($r=-.88$). The results indicate that increases of suspended solids and fine substrate materials reduce the number of trout embryos that hatch and emerge and probably causes a decrease in trout biomass.

HACKNEY, COURTNEY T. University of North Carolina at Wilmington--Notes on the ecology and limits of distribution of the Carolina Marsh Clam, *Polymesoda caroliniana*.

The carolina marsh clam was collected at eight different sites in Louisiana, Mississippi, Florida, Georgia, and North Carolina. Adult clams were found in permanently flooded habitats, irregularly flooded marshes (12% inundation), on soft substrate shorelines, and in tidal swamps. The only constant variable among all stations was low salinity, less than 10 o/oo. Some small populations were also found in higher salinities, but generally consisted of only one or more size classes while populations from lower salinity areas consisted of many different size classes. One population in a well-flooded portion of a Louisiana marsh contained many individuals exceeding 55 mm with one specimen 58 mm. Most individuals in intertidal populations seldom exceeded 50 mm. The average size of individuals in subtidal or well-flooded habitats was larger than most intertidal habitats. Intertidal populations were reproductively active with gravid females found most months of the year. Shell shape varied from the normal oval shape in populations at Yankeetown, Florida, and at Skidaway Island, Georgia.

HANNAN, RICHARD R. Kentucky Nature Preserves Commission--A vegetation survey of bottomland hardwood forests in west-central Kentucky.

One hundred fifty-four 0.04 ha circular plots were utilized to determine importance values of canopy trees in bottomland hardwood sites identified as ecologically significant by the Kentucky Nature Preserves Commission during an environmental resources inventory of the Shawnee Hills Section of the Interior Low Plateaus Physiographic Province of Kentucky. The forests varied from old-growth to well-developed second growth. Basal area values ranged from 26.4-58.3 m²/ha. Eleven distinct forest communities were identified. Multi-dimensional ordination indicated three vegetation types; silver maple slough forests, pin oak, and oak-hickory hardwood bottoms. Pin oak hardwood bottoms were the most widespread and floristically diverse of the forest types identified. An additional forest type dominated by *Taxodium distichum* was in permanently flooded areas. All sites were subject to flooding. Periodicity and duration of flooding appear to be the primary factors determining the complexity of composition in these bottomland forests.

HARDIN, JAMES W. North Carolina State University--A ferruminate leaf surface in Rhododendron.

The abaxial leaf surface of *Rhododendron* maximum is tomentose at first, then soon becomes tomentulose and finally puberulent as the blade expands and the trichomes become more widely spaced and some drop off. There are five trichome types scattered on the surface as identified by SEM: furcate, dendritic, rosulate, stipitate glands, and bifid glands. The surface is glossy and pale to the naked eye. The cuticle, at X200, is smooth or rugulate. Later in the first year the trichomes (furcate, dendritic, and rosulate forms) become sticky and matted and form a more or less continuous or scaly, shellac-like coating, often completely covering many of the stomata. This glossy, often brownish, epicuticular layer is thus formed by the conglutination and then drying of resinous material from the degradation of trichomes. This type of cemented surface covering, developed from trichomes rather than epicuticular wax, is termed "ferruminate" from the Latin *ferrumen*, meaning cement. This unique covering is described and named here for the first time. This ferruminate surface, covering many stomata, may be of selective advantage in decreasing transpiration in this evergreen shrub. The related *R. catawbiense* and the lepidote species have developed entirely different adaptive strategies which decrease water loss.

HARLEY, JOHN P. Eastern Kentucky University--Canine Filariasis in Southcentral Kentucky.

Prevalence of *Dirofilaria immitis* and *Dipetalonema reconditum* in a sample of 235 dogs from southcentral Kentucky was determined

during 1979. Blood samples were taken and classified according to the dog's hair length, age, sex, and environment (house dogs, 50% house/50% yard dogs, and yard dogs). There were no significant differences in prevalence of heartworm disease in relation to sex and varying hair length. The major differences between infections were the dog's environment and age. These and other data reported here constitute the first epidemiological survey of canine filariasis in Kentucky.

HARRIS, JOSEPH B. University of Wisconsin-Stevens Point--Effects of kinetin on aging tobacco leaves.

It has been well established that kinetin application retards leaf aging in many species. A study of its spectrum of effects was undertaken. Lower leaves of *Nicotiana tabacum* (L.) were treated for 10 hours each night for two weeks in 10 ppm of kinetin in distilled water. Samples were taken for ultrastructural, protein, chlorophyll and carbon-fixation studies at four stalk positions. Ultrastructural observations of chloroplasts showed that kinetin maintained the integrity of those from the older lower leaves equivalent to that of upper leaves. Chloroplasts of control leaves disintegrated. Protein and chlorophyll levels were enhanced, and carbon-fixation rates were substantially increased due to kinetin. Treatment of lower leaves reduced protein and chlorophyll levels of the untreated upper leaves. But it enhanced the rate of carbon fixation per unit of chlorophyll and protein. Based on rates of fixation per unit of chlorophyll and protein, carbon fixation efficiency was greater in old (lower) than young (upper) leaves and kinetin increased this efficiency. Effects on carbon metabolism were surveyed.

HARRISON, FREDERICK W. and RONALD R. COWDEN. Western Carolina University and East Tennessee State University--Sialic acid patterns during oogenesis and larval development in Eunapius fragilis (Leidy).

Specimens of the freshwater sponge, *Eunapius fragilis*, which were reproducing sexually were fixed in ethanol-acetic acid (3:1). Tissues were routinely embedded in Paraplast-plus and were serial sectioned at 6µm. Sialic acid was localized using the fluorescent method of Weber et al. (1975). Sialic acid was also quantitated using the thiobarbituric acid assay (Aminoff, 1961). Spongillid oogenesis involves oocyte growth in which reserve materials are initially assimilated directly from the mesohyl. Later in oogenesis (stage 2), developing oocytes phagocytize trophocytes and synthesize vitelline platelets. Cleavage is followed by stereoblastula formation and larval development. Sialic acid is associated with cytoplasmic inclusions, nuclear membranes, nucleoli, and the cell surfaces of early oocytes. In stage 2, phagocytized trophocytes apparently are not immediately degraded and appear to transfer sialic acid-containing inclusions into the oocyte cytoplasm. During embryogenesis, sialic acid-rich vitelline platelets are mobilized. Sialic acid is localized distally in flagellated surface

epitheliocytes and is associated with the connective tissue stroma of the parenchymula larva.

HENSHAW, NANCY G. University of North Carolina at Chapel Hill-- Pneumocystis carinii: freeze-fracture ultrastructure.

Pneumocystis carinii is a saprophyte that causes interstitial plasma cell pneumonia in infants and diffuse alveolar pneumonia in immunodeficient and immunosuppressed children and adults. With the increasing use of immunosuppressive therapy, pneumocystosis has become increasingly common. Male rats were immunosuppressed with cortisone acetate. After 9-12 weeks of treatment, selected lung tissues were used for dry tissue impression smears, and for perfusion with 10% para-formaldehyde. Tissues for thin sections were post-fixed with osmium tetroxide and processed using standard techniques. Tissue for freeze-fracturing was infiltrated with 25% glycerol, mounted on double replica stubs, and frozen in liquid freon. Sections of lung tissue were stained with Grocott-Gomori's methenamine silver. The various stages of the parasite were studied using impression smears stained with Giemsa, and with freeze-fracture techniques. Structural differences between the cyst and trophozoite, and their surfaces, showed that the cyst wall is much more complex than previously thought. The basic ultrastructure of other characteristic organelles was confirmed by freeze-fracture. Additional study of the structure of the cyst wall may help clarify the taxonomic position of this organism, as well as aid in the understanding of its pathogenesis.

HESS, STEPHEN D. and DAVID J. PRIOR. University of Kentucky. Effects of Hemolymph Osmolality on the Isolated Pedal Ganglion of the Terrestrial Slug, Limax maximus.

Limax maximus encounters a wide range of both hydrating and dehydrating stresses in the environment. Limax can easily tolerate passive water losses of up to 40% of its initial body weight; as a result of these dehydration-induced water losses, hemolymph osmolality increases in an exponential manner. Hemolymph Na^+ , K^+ and Mg^{++} also increase with dehydration; only hemolymph Ca^{++} appears to be regulated over the range of dehydration examined. As the brain is bathed by the hemolymph, such variations in osmolality and ionic content would be expected to affect nervous system activity. Preliminary extracellular recordings from isolated brain preparations show decreased impulse frequency of units from the pedal ganglion when 1.0 X saline (145 mOsm/Kg H_2O) is replaced with 1.5 X saline (195 mOsm/Kg H_2O). Initial intracellular recordings from identified neurons in the pedal ganglion also indicate that impulse frequency decreases in 1.5 X saline. In addition to these results, recordings obtained in experimental salines prepared to approximate dehydration-induced hemolymph ionic changes in vivo will be present-

ed. (Supported by National Science Foundation Grant BNS-74-15217-A01 and a grant from the Whitehall Foundation).

HOLMES, LAURENCE H. JR. Western Kentucky University--Spring migratory strategy in the purple finch, *Carpodacus purpureus*.

Comparisons of physiological mechanisms involved in avian migration between migrants with different migratory strategies might provide further insight into these mechanisms. In that most behavioral and physiological studies of migration have been carried out in passerine species that migrate at night, studies were conducted in purple finches to explore the possibility that this species has a diurnal migratory strategy. Male birds captured from winter flocks were placed in individual cages located within photoperiodic chambers and held under non-stimulatory photoperiodic conditions (LD 8:16) until late spring at which time they were placed under stimulatory photoperiodic conditions (LD 15:9). Fat stores, molt and body weight were monitored on a weekly basis in order to determine seasonal condition. In addition testicular growth was assessed by laparotomy at appropriate intervals and locomotor activity recorded daily using an Esterline-Angus Event Recorder. Migratory orientational behavior was monitored using Kramer cages located out-of-doors. Preliminary examination of these data indicates that the purple finch is primarily a diurnal migrant.

HORNBY, PAMELA J. and LEO S. DEMSKI. University of Kentucky--Cardiac changes evoked by electrical stimulation of the brain in the anesthetized goldfish, *Carassius auratus*.

Holmgren (Acta Physiol. Scand. 99:62-74, 1977) has given evidence for a direct sympathetic innervation of the teleost heart. This is in addition to the accepted role of the vagus in parasympathetic modulation of heart rate. Direct electrical stimulation of the brain was used to investigate the possibility of a single parasympathetic, or a dual sympathetic parasympathetic role in cardiac regulation. Fish were maintained under light anesthetic (0.3% urethane) in a stereotaxic device. Stimulation was applied through monopolar electrodes as a biphasic square wave pulse pair at a frequency of 50Hz. Heart rate changes were not evoked from sites in the olfactory tracts, telencephalon, and cerebellum. Cardiac deceleration was evoked at low threshold (10-30 μA) in the ventral thalamus-dorsal hypothalamus transition zone, the tegmentum above the tectobulbar fibers, in the vicinity of the motor nucleus of the vagus, in the nerve and root fibers of the vagus, and in the basolateral medulla in what appear to be reticular areas. Cardiac acceleration was evoked in the dorsal region of the vagal lobes. Preliminary pharmacological studies using cholinergic and adrenergic blockers, support a single parasympathetic regulation of heart rate. A pathway of brain areas involved in cardiac modulation will be discussed.

HOWARD, JAMES H. and James G. Devereux. Frostburg State College¹ and Appalachian Environmental Laboratory²--Habitat preferences of sympatric salamanders of the genus *Desmognathus*. *Desmognathus monticola*, *D. ochrophaeus* and *D. fuscus* form a stream-bank salamander community throughout much of the Appalachian mountains. This community has been examined by Krzysik (1979) who concluded that niche differences among these three species has resulted from interspecific interference competition. Hairston (1980) looked at a different complex of *Desmognathus* salamanders and concluded that predation not competition, was the major ecological force shaping the community. Our experiments are being conducted in the laboratory under carefully controlled conditions, designed to demonstrate preferences for a number of habitat variables identified by Krzysik (1979). Field collected animals are given 24 hours to search an enclosure and establish residence. Animals are located in the enclosure and their positions with respect to the habitat gradient recorded. After preferences for one variable have been established for each species, sympatric trials are conducted to determine if there are shifts in preferences which result from species interactions. Cover size experiments have been completed for all three species in allopatry. Mean rock size selected was 317.4 cm² for *D. monticola* (n = 36), $\bar{x}$ = 379.8 cm² for *D. ochrophaeus* (n = 34), and $\bar{x}$ = 318.0 cm² for *D. fuscus* (n = 29). No statistical differences exist among these means. Sympatric studies are continuing as are allopatric studies on moisture and substrate type.

IRELAND, PATRICK H. Radford University--Demography of pond and mountain spring populations of *Eurycea longicauda*. Larval *Eurycea longicauda* morphologically conform to the mountain spring type; however, this species is known to breed in both springs and ponds. This study compares selected demographic parameters of pond and spring larval populations. The two populations studied were within 300 M of each other eliminating geographic variation in demography known among *E. longicauda* populations. The adult population was estimated at 376 with a 1:1 sex ratio. During the breeding session 96 adults were collected near the pond and 87 adults were collected near the spring. Adults were found near the spring throughout the year but were collected near the pond only during the breeding season. Population size estimates of newly hatched larvae were 870 for the pond and 796 for the spring. Sixty days after hatching the population size estimates were 501 for the pond and 196 for the spring. Pond larvae transformed 10-25 days faster than spring larvae. Pond larvae grew faster with lower mortality than spring larvae. These differences could be due to water temperature and predation.

JACOBS, BRIAN F., CHARLES R. WERTH, and SHELDON I. CUTTMAN. Miami University--Allozyme variation in eastern U. S. *Abies*. Eastern U. S. *Abies* is commonly divided into two species, *A. balsamea* and *A. fraseri*, distinguished by relative cone bract to subtending scale lengths. Intermediate individuals have been recognized as *A. balsamea* var. *phanerolepis*. Three alternative models have been offered to explain the relationship of *A. fraseri* to *A. balsamea*: (1) clinal fragment, (2) high moisture ecotype (3) intermediates represent introgressed forms. Allozyme data was used to evaluate these models through a determination of genetic differentiation within and between populations. Initial data indicate little intra- or inter-population differentiation over 16 loci.

JANDEBEUR, THOMAS S. Athens State College--A status report on the spring pygmy sunfish, *Elassoma* sp., in northcentral Alabama. Acting through the Fish and Wildlife Service, the Department of the Interior on July 27, 1979 published in the Federal Register (Vol. 44, No. 146, p. 44418) a proposal to place the spring pygmy sunfish, *Elassoma* sp., on the Federal Endangered Species list. Beginning August 19, 1979 and continuing through August 26, 1979, intensive field work was carried out in an attempt to determine the range and abundance of this species, with particular attention to the area designated critical habitat in the aforementioned proposal. Eleven sites within the Beaverdam Creek watershed, and 26 sites in drainage systems adjacent to Beaverdam Creek were investigated. Based on available data, it appears that the spring pygmy sunfish is restricted in its distribution to the Beaverdam Creek watershed in Limestone county, Alabama. Critical habitat for this species appears to be Moss Spring and its run to Beaverdam Creek, Lowe's Ditch, and areas within Beaverdam Swamp which are heavily vegetated with *Myriophyllum*, *Ceratophyllum*, *Utricularia*, and *Eloidea*. In addition to continuing the search for other spring pygmy sunfish populations in the southern bend region of the Tennessee River system, it is recommended that a full-scale life history and ecology field study of this species be undertaken, and that Pryor Spring and Blair Spring, in Limestone county, and Kelly Spring, in Madison county, be investigated as potential sites for *Elassoma* sp. introduction.

JANDEBEUR, THOMAS S. and MICHAEL G. CHAPMAN. Athens State College--A report on the fishes of the Paint Rock River System in Alabama. The Paint Rock River, tributary to the Southern Bend of the Tennessee River, is located in Jackson, Madison, and Marshall counties, Alabama, and in

Franklin county, Tennessee. A total of 47 seine collections from stations located throughout the drainage system has so far revealed the presence of 64 species representing 26 genera and 11 families. Included among these species are: Notropis sp. cf. procne, the paleband shiner; Hybopsis dissimilis (Kirkland), the streamline chub; Percina tanasi Etnier, the snail darter; and the following species of special concern among Alabama's freshwater fishes: Hemitremia flammea, Hybopsis insignis, Notropis boops, Notropis sp. cf. spectrunculus, and Etheostoma z. zonale.

JETTON, THOMAS L. Western Carolina University--Cytological and cytochemical investigations of development from dormant gemmules in the marine sponge, Haliclona loosanoffi.

Haliclona loosanoffi is one of the few marine sponges that form gemmules, the poriferan asexual reproductive body. This sponge exists in the active form for less than six months of the year on the Connecticut coast. It occurs exclusively as dormant gemmules during the colder months. Hatching occurs with the onset of warmer temperatures. Gemmules of H. loosanoffi were hatched in sea water at room temperature (20-23°C). Sponges were fixed in either ethanol-acetic acid (3:1) or Bouin's solution at 24 hour intervals, 0-11 days. Tissues were routinely processed and embedded in Paraplast-plus prior to serial sectioning at 6 µm. A variety of absorption and fluorescent dye techniques were employed to investigate morphogenetic patterns occurring during germination. As opposed to the situation in freshwater sponges, yolk cells (thesocytes) of the dormant gemmule are mononucleate. Elaboration of an intragemmular connective tissue framework begins by day 3. Spicule formation is initiated by day 5. Hatching, nonsynchronous in gemmules on the same substratum, may occur by day 7. A superior pinacoderm and choanocytic chambers are present by day 11. Cytochemical patterns indicate that during morphogenesis, the processes of cytodifferentiation and mobilization of nutrient reserves are interrelated.

JOHNSON, MILES F. Virginia Commonwealth University--Studies in the Flora of Virginia: Asclepiadaceae.

The Asclepiadaceae consists of three genera in Virginia: Asclepias - 13 species, 2 sub-species; Cynanchum - 1 species and Matelea - 4 species. Nomenclature follows Woodson for Asclepias and Drapalik for Matelea; thus M. suberosa (L.) Shinnery is in synonymy under M. gonocarpa (Walter) Shinnery. Distribution maps based on herbarium specimens and personal collection show ubiquitous species (A. tuberosa) and very restricted ranges (A. lanceolata and A. rubra). Taxa are determined with a new key which utilizes floral and vegetative characters.

JOHNSTON, GAIL F. Mississippi State University--Functional morphology of external oral features of anuran tadpoles.

External oral features are a major source of information in the identification of tadpoles. However, little is known about the functions of these structures relative to the ecology of the tadpoles, i.e., how the external oral features relate to the feeding abilities of the animal. The modes of action of the mouthparts of nine species (3 families) of tadpoles were illustrated by examination of the feeding marks left on a standardized (1% or .5% agar-based food) substrate. Latex casts of the marks made the finest details of the marks permanent and more easily seen. Measurements of the marks were correlated with the morphology of the tadpoles. The results were often contradictory to general statements concerning the functions of the mouthparts and were not easily explainable with the present anatomical data. Especially the functions of the keratinized jaw sheaths were more diverse than previously expected.

JONES, E. BARRETT, T. DANIEL KIMBROUGH and RICHARD R. MILLS. Virginia Commonwealth University.--Synthesis of dopamine-N-acetyltransferase during the ecdysial cycle of the American cockroach.

The ecdysial cycle of American cockroach nymphs (600 mg or larger) takes approximately 28 days at 80°C. Ecdysis or the shedding of the old cuticle is preceded by apolysis. N-acetyltransferase, a key enzyme in the postecdysial cuticle sclerotization process causes the synthesis of N-acetyldopamine. The N-acetyldopamine binds to proteins to produce an insoluble matrix. To analyze for the de novo synthesis of the N-acetyltransferase, nymphs are bled and dissected. The integument fat body and gut were homogenized and centrifuged and cells separated from the serum. All five tissues were taken from interecdysial, post apolysis and ecdysial animals. The fat body and blood have high N-acetyltransferase activity when taken from ecdysial animals, and a lesser amount from post apolysis. Other tissues show little or no activity at any time.

JONES, RONALD L. Eastern Kentucky University--Variation in Aster patens Ait.

Aster patens Ait. includes both diploid and tetraploid populations, and exhibits a large degree of involucre variation over its range. Studies were conducted to determine the patterns of variation, their relationships to chromosome number, and their taxonomic implications. A chromosome survey involving 36 populations indicates that the diploids occur only from western Alabama to Texas and Oklahoma, while

the tetraploids occur throughout the range of the species. A survey of about 1100 herbarium specimens shows that the differences in phyllary size and pubescence have geographic correlations, but many specimens also exhibit intermediate forms. Garden and greenhouse investigations demonstrate that the regional involucral differences do have a genetic basis. The taxonomic conclusion from these studies is that *Aster patens* Ait. consists of three varieties: var. *gracilis* Hooker, a largely diploid group of the southwest; var. *patentissimus* (Lindl.) T. & G., a tetraploid group of the Interior Highlands; and var. *patens*, a largely tetraploid group of the eastern United States.

JUST, JOHN J. and DEBORAH ANN CHECK.
University of Kentucky--Cellular quantitation of the red blood cell transition during natural metamorphosis in *Xenopus laevis*.

A transition has been seen in red blood cells during anuran metamorphosis, prompting the hypothesis that during climax an adult RBC population containing adult Hb replaces a larval RBC population containing larval Hb. The transition from larval RBC's to adult RBC's during natural metamorphosis in *Xenopus laevis* was followed by the use of a cell separation technique involving continuous density gradients composed of Renografin. The concentration of Renografin ranged from 27% at the top to 33% at the bottom of the gradient. After centrifugation in this gradient the larval and adult RBC's formed bands at different positions in the gradient. Adult RBC's first appeared in the circulation of a Stage 57 (Nieuwkoop & Faber) tadpole, and attained a 1:1 cell ratio with the larval RBC's during mid-climax, Stages 61 - 64. Adult RBC's completely replaced the larval RBC's within a month post-climax. The adult RBC's were produced at a rate of 5.25×10^5 RBC's/day, while the larval RBC's disappeared almost twice as fast with a rate of 1.17×10^5 RBC's/day. It is believed that these rates reflect a selective destruction of the larval RBC's during climax, supporting the hypothesis that the larval cell line disappears during climax to be replaced by a separate adult cell line. Supported in part by NIH Research Grant R01 AM16-126-04, Biomedical Research grant 2507 RR07114-12, and the University of Kentucky Research Foundation.

KIMEROUGH, T. DANIEL and
GEORGIANNA INGERSOLL. Virginia
Commonwealth University--The effects of plant serotonin extracts on perfused animal tissue.

Some physiological responses induced by serotonin (5-hydroxytryptamine) extracted from plants have been measured. Isolated segments of mouse duodenum served as sensitive tissue markers of extracted plant serotonin which was added to the

perfusate. These extracts were sequentially representative of the developmental and growth stages of selected plants. This particular study was conducted as a preliminary phase of a project designed to ascertain the role that serotonin might play in the synthesis of the indole auxin, 3-hydroxyindole acetic. In animals, serotonin is degraded by monoamine oxidase to 5-hydroxyindole acetic acid. Of special concern during this investigation, was the relative physiological effect that serotonin of botanical origin might have upon the body systems of animals who consume plants as food. We have been able to report at this time that the mouse gut has shown progressively greater levels of activity upon being perfused in correspondingly higher concentrations of plant serotonin.

KIVIC, PETER A. and PATRICIA L. WALNE.
University of Tennessee, Knoxville,
Knoxville, Tennessee--Photosensory transduction in *Euglena*: repetitive stimulation causes anomalous results.

Among the many mechanochemical processes now known to be regulated by Ca^{++} are the responses of a number of cilia and flagella to external stimuli. A prominent example is the *Euglena* locomotory flagellum, which exhibits a Ca^{++} -dependent directional reorientation in response to changes in illumination. The behavior of *E. gracilis* following exposure to flashing light for a prolonged period is determined by the availability of Ca^{++} in the external medium. Cells illuminated in the absence of Ca^{++} exhibit continuous repetitive changes of direction, whereas those illuminated with Ca^{++} become immobile. In both cases photo responsiveness is lost. The results seem to be at variance with the recent Doughty-Diehn model of englenoid sensory transduction, in which an (indirectly) light-induced influx of extracellular Ca^{++} triggers the flagellar reorientation.

KRISSINGER, WAYNE A. Georgia Southern
College--A Scanning Electron Microscopic Investigation of the Outer Surface of *Lutztrema monenteron* and *Lutztrema microstomum* (Trematoda: Dicrocoeliidae).

A scanning electron microscopic (SEM) investigation was carried out using the adult stages of *Lutztrema monenteron* and *Lutztrema microstomum*, that were removed from the gall bladder of the definitive hosts. The fine morphology was studied with the SEM and the following observations made. The body of these flukes is characterized by transverse ridges that encircle the worms at regular intervals with the ridges being composed of protuberances, each of which has micro-projections. These ridges are less prominent post-acetabular and the protuberances give a mosaic tile appearance. At both oral and acetabular suckers the ridges are running perpendicular to the ridges which encircle the body. A number of large non-ciliated papillae surround the oral sucker;

they are found in longitudinal rows ventrally and laterally pre-acetabular and are randomly arranged over the post-acetabular body. There are few papillae around the acetabulum and are often paired laterally. The excretory pore and protrusible cirrus were observed. This research was supported by Georgia Southern College Faculty Research Grant.

LEMPKE, HANNAH, GERALD C.
LEWELLYN and RICHARD R. MILLS.
Virginia Commonwealth University.
--Zinc absorption by the midgut of the American cockroach.

Feeding response, gut retention, defecation and absorption of ^{65}Zn by large cockroach nymphs has been measured. Radioactive zinc mixed with Purina dog chow and sucrose was ingested. The content of the ^{65}Zn in the gut epithelial cells and other tissues has been determined. Separation of protein bound ^{65}Zn moieties has been achieved by molecular sieve chromatography.

LEUNG, TAT-SING., SYED M. NAQVI and CORNELIUS LEBLANC. Southern University--
Basagran® (Bentazon) and diquat toxicity to mosquitofish, *Gambusia affinis*.

Basagran® is used in Louisiana for controlling broad-leaved weeds of soybean. Diquat is mainly used for controlling aquatic weeds. Freshly prepared 1% aqueous stock solution of herbicides were further diluted to desired concentrations by serial dilution method. Test solutions were prepared from deionized (synthesized) water. Fish were collected from a local lake and acclimatized 96-h in the laboratory. Bioassays were conducted at 22±1°C and 60±5% room humidity. Mortalities were recorded at 24-h intervals. Based on percent mortality data, LC_{50} values were determined by Finney's Probit Analysis Computer Program available on Statistical Analysis System. The 24 and 96-h LC_{50} values for Basagran® were 4,249 and 3,874 (ppm), respectively. The 24 and 96-h values for diquat were 723 and 289 (ppm), respectively. Some fish were naturally infested with a nematode worm and were more susceptible to herbicide toxicity than non-infested fish. It was observed that worms bulged out those fish's body which were exposed to higher concentrations of Basagran®. Hemorrhaging of gills and fins were noticed in diquat-treated fish.

LINDSAY, DAVID S.,¹ WILLIAM L. CURRENT,¹ and JOHN V. ERNST,² Auburn University¹ and USDA-AR.²--Life cycle of *Isospora suis* of swine.

Sporogonous development of *Isospora suis* of swine was determined using established guidelines. Uninucleate sporonts underwent nuclear division, became binucleate, and then divided to form two round uninucleate sporoblasts. Binucleate sporoblasts elongated to form binucleate sporocysts, each of which then gave rise to four sporozoites.

Sporulation was completed within 56 hr at 20°C, 40 hr at 35°C, 16 hr at 30°C, and 12 hr at 37°C. When sporocysts were freed mechanically from the oocysts and exposed to excysting solution, movement of the sporozoites was seen inside the sporocyst within 5 minutes. Indentations in the sporocyst wall became apparent and total or partial collapse of the sporocyst wall followed. Immediately following collapses of the sporocyst wall, released sporozoites were sluggish but they became more active after incubation in excysting solution. The early endogenous development of *I. suis* was also studied to supplement an earlier report which described stages from 1.5 to 10 days post inoculation. Stages seen at 20 hr postinoculation were sporozoites, binucleate Type 1 meronts and Type 1 merozoites indicating that merogony takes place 24 hr earlier than previously described.

LINDQUIST, DAVID G.,¹ L. MICHAEL JONES,¹ JOHN R. SHUTE,² and PEGGY W. SHUTE,² University of North Carolina-Wilmington¹ and University of Tennessee²--Spawning success of the Waccamaw darter under artificial substrates.

Previous experiments by Jones et al. (1981. ASB Bull. 28:68) demonstrated that *Etheostoma perlongum* will spawn under artificial substrates such as ceramic tiles and half round PVC pipe sections. Questions raised by these experiments were addressed by a new protocol for the 1981 spawning season: 1) nest size (egg number) and male size (standard length); 2) substrate quality (curved vs. flat) and size (area) vs. nest size and male size; 3) nest size and habitat (depth and sediment type); 4) the effect of crowding nest sites; and 5) duration of nest occupation by males. Three sizes of square slate (22, 29, and 44 cm) and one size terracotta roofing tile were selected for artificial substrates. Males were marked via subcutaneous injection of acrylic dyes. Preliminary analysis of data indicate: 1) a low return on marked nesting males; 2) nesting at all habitats and substrate types; 3) preference for slates over tiles when choice available; 4) no great difference in egg production under the larger substrates and 5) egg deposition and nesting activity beginning in early March and terminating in mid-June. The low return of marked nesting males appears to suggest that nesting males may not have a very high degree of fidelity for a single nesting site. This study was made possible by grant-in-aid funds under Section 6 of the Endangered Species Act of 1973 (PL 93-205) to David G. Lindquist.

LISLE, JOHN T. and DAVID N. MARDON. Eastern Kentucky University--Influence of Recreational Activity, Precipitation and Water Turbidity on selected Microorganisms in the Kentucky River near Booneshoro State Park.

A modified water sampler for collecting microbial samples from selected depths was used at seven sampling sites on the Kentucky river to measure concentrations of total coliforms, fecal coliforms, fecal streptococci,

Candida albicans, Pseudomonas aeruginosa and Staphylococcus species. Numbers of fecal streptococci and Staphylococcus species increased significantly with increased recreational activity, precipitation and water turbidity. Total coliform counts increased with recreational activity and precipitation while Candida albicans increased with increasing recreational activity and water turbidity. Fecal coliform counts did not significantly change with recreational activity but did increase when there was an increase in precipitation or water turbidity. There was no consistent increase in the numbers of Pseudomonas aeruginosa recovered with changes in any of the parameters monitored in this study. These data suggest that examinations of only total coliforms and fecal coliforms would not adequately reflect the presence of opportunistic microbes at sites of this type.

LOHRMAN, TIMOTHY, T. DANIEL
KIMBROUGH and R. R. MILLS.
Virginia Commonwealth University--
An analysis of intestinal protein
molecules as related to gut moti-
lity in the American cockroach.

Entire intestinal tracts of Periplaneta americana were homogenized and protein extracts were prepared for gel-column analysis. A P-10 polyacrylamide gel was employed to separate certain bioactive compounds which associate with the proteins. It had been earlier postulated that these protein molecules may constitute discrete receptor sites to which such biogenic amines and neurotransmitter chemicals as norepinephrine, acetylcholine and serotonin may bind. The methodology involved correlating measurements of neurotransmitter-induced gut motility with fluorometric quantitation of these compounds. The preliminary results that we have obtained seem to confirm our postulate.

LYONS, E.T. University of Kentucky--Prevalence of Microfilariae (Onchocerca spp)
in Skin of Kentucky Horses at Necropsy.
Microfilariae of Onchocerca spp were found in skin samples of 52% of 168 horses examined at necropsy in Central Kentucky. Ten breeds or mixed breeds, mostly thoroughbreds, were included in the examination as were males, females, and geldings. Microfilariae were not recovered from horses less than or equal to one year old. Ten, two year olds were examined and only two were positive for microfilariae. For ages three to 26 years, the mean infection rate was 63%, with a range of 33% to 100%. Most microfilariae resembled those described as Onchocerca cervicalis.

MACGREGOR, JOHN and GREGORY SIEVERT. Kentucky Fish and Wildlife Resources, and Eastern Kentucky University--The geographic distribution of salamanders of the genus Plethodon in Kentucky.

Five species of woodland salamanders of the genus Plethodon are presently known to occur in Kentucky. These include 3 species (P. cinereus, P. dorsalis, and P. richmondi) in the eastern small plethodon group and 2 species (P. glutinosus and P. kentucki) in the eastern large plethodon group. Plethodon cinereus is known from only 2 counties in extreme northern Kentucky. Its range is limited here by the Licking River to the east and (apparently) by the occurrence of P. richmondi to the south. Plethodon dorsalis exhibits considerable geographic variation and is widespread in Kentucky. Records range from the bluffs bordering the Mississippi River in the west to the Cumberland Plateau in the east. Plethodon richmondi occurs throughout the Cumberland Plateau and the northern and eastern portions of the Bluegrass section. Its range appears to be limited by the occurrence of P. dorsalis. Syntopic populations of richmondi and dorsalis have been discovered in 7 Kentucky counties, and interdigitating single-species populations are frequent in the zone of contact. In Kentucky, P. glutinosus occurs statewide. In southeastern Kentucky, it coexists with P. kentucki in at least 6 counties. Plethodon kentucki has not been found at any site where glutinosus does not occur. At one station, however, kentucki, was taken 12 times as frequently as glutinosus.

MACLEISH, NANDA P. F. University of Georgia--Systematics of Eremanthus Less. and related Vernoniaceae genera.

Eremanthus Less. (Vernoniaceae:Compositae) comprises syncephalous herbs, shrubs and trees largely restricted to the Central Brazil Plateau of South America. The systematics of Eremanthus has not been reevaluated since Baker (1873); a comparison of Baker's treatment with those of De Candolle (1836) and Schultz-Bipontinus (1861, 1863) suggests a less than optimal understanding of generic and specific boundaries within these species' groups. The plethora of names introduced by post-Baker authors reflects the attempts of herbarium curators to identify Brazilian collections in the absence of adequate documentation. Despite a proliferation of extant names, the sections delineated by Baker, which parallel the generic concepts of De Candolle, appear to represent discrete morphological entities. Variation within this species' group largely appears to represent a cline from non-syncephalous forms approaching Vernonia to the highly syncephalous forms evident in Lychnophora. This morphological cline (supported by anatomical and palynological evidence) represents the polyphyletic origin of Eremanthus proposed by some authors - principally De Candolle. In addition, comprehensive investigations utilizing such data sources support the generic delineation of the related Vernoniaceae taxa Albertinia Spreng., Glaziovianthus Barroso, Pithecoseris DC. and Vanillosmopsis Sch. Bip.

MAJOR, VICKI, SHARON PATTON and C.S. PATTON. University of Tennessee Veterinary College--Interesting Helminths from a Raccoon in East Tennessee.

An adult male raccoon which exhibited abnormal behavior was euthanatized and necropsied at the UTCVM. Distemper and rabies were suspected but laboratory examination for these diseases were negative. Plerocercoids (spargana) were found at necropsy in the subcutaneous fat of the abdomen, pelvis and thighs. These were fed to a cat and 15 days later pseudophyllidian tapeworm eggs, tentatively identified as Spirometra were found on sedimentation examination of feces. Two Macracanthorhynchus sp. were recovered from the jejunum and numerous digenetic trematodes were in the esophagus and intestine. Fifteen Gnathostoma procyonis mature adults and one immature Physaloptera were imbedded in the stomach. Eosinophilic granulomas containing trematode eggs (probably Heterobilharzia) were found in the liver which was firm with numerous opaque white thickenings of the capsule. The lungs contained numerous yellow nodules which histopathologically appeared as multifocal eosinophilic granulomas produced by migrating helminths. Plerocercoids were also seen in the lungs. A park service official speculated that this raccoon was imported from Florida in a group released for hunting. Heterobilharzia and Spirometra are not common to Tennessee raccoons.

MAMARIL, AUGUSTUS C. and ARMANDO A. DE LA CRUZ. Mississippi State University--Seasonal zooplankton assemblages in a small subtropical impoundment.

Seasonal changes in the composition of zooplankton of a 1.5 ha subtropical impoundment (Dorman Lake) in northeastern Mississippi were studied from October 1980 up to October 1981. Monthly samples were collected from surface waters by standard plankton nets from the limnetic, shallow (1 meter deep) and littoral areas at noon and midnight. Twenty-seven species of Rotifera are recorded, several of which are cosmopolitan (Lecane bulla, L. pupana, L. unguolata). Copepoda is represented by one calanoid, Diaptomus mississippiensis, and five species of cyclopoids. The Cladocera includes 12 species. Autumn-winter communities were dominated by D. mississippiensis, Mesocyclops edax, Daphnia sp. and by the rotifer Kellicotia longispina. Spring assemblages included large populations of D. mississippiensis, M. edax, with Daphnia dominating the limnetic area whereas Bosmina sp. was more abundant in the shallow and littoral waters. Kellicotia was dominant until March, after which Keratella cochlearis became the most dominant until September. K. longispina was totally absent during the summer months (May-August). D. mississippiensis was almost completely absent in May and only juvenile forms were present until September. Summer Cladocera was represented by small populations of Chydorus, Scapholeberis, and Diaphanosoma.

MARION, KEN R. University of Alabama in Birmingham--Lizard reproductive strategies: caloric determination of between-clutch egg sizes in a southeastern population of fence lizards, Sceloporus undulatus.

Several studies on caloric contents of eggs from western populations of Sceloporus undulatus have previously demonstrated larger egg sizes and a greater caloric content per egg in later clutches when compared to earlier ones. Statistical analysis of these same properties in eggs of S. undulatus from north central Alabama revealed no significant differences in egg dry weight and calories per egg between the first clutch of the year and the last. There was, however, a strong tendency for first-clutch eggs to be larger. Egg size was correlated to the size of the female, and all the eggs of a female varied little in size. The contrasting results when compared to the western populations are discussed in terms of differing regional reproductive strategies, and interpreted in light of seasonal differences in food availability.

MCCAULEY, DAVID E. Vanderbilt University--The behavioral components of sexual selection in the milkweed beetle Tetraopes tetraophthalmus.

Body size specific variation in male mating success has been demonstrated in the milkweed beetle, Tetraopes tetraophthalmus by several authors. This study attempts to identify the behavioural components of this variable mating success and partition them into intrasexual and intersexual selective events. In laboratory studies, no evidence was found for an intersexual component of mate selection; neither female choice nor a variable propensity of males to mate. In both laboratory and field studies, however, male-male fighting was shown to play a large role in determining the mating success of individuals. Body size related variation in mating success results, in part, as a consequence of the high probability that the larger of two interacting males will deny the smaller male access to any nearby females.

MCDONALD, CHARLES B. and ANDREW N. ASH. East Carolina University--Structure and successional trends of an Atlantic white cedar (Chamaecyparis thyoides) forest in Tyrrell County, North Carolina.

Almost pure stands of Atlantic white cedar (Chamaecyparis thyoides) develop in conjunction with either pocosin or gum-cypress swamp forest in the Coastal Plain of the Carolinas and Virginia. When associated with pocosin fire usually prevents the stands from attaining any great age, but in swamp forests the wetter substrate reduces fire allowing the development of much older stands. One swamp forest stand in Tyrrell County, North Carolina was analyzed with quarter-point samples and increment borings. From its well developed subcanopy of black gum (Nyssa sylvatica var. biflora), this stand indicates that the Atlantic white cedar forest is a successional community that if left undisturbed will eventually be replaced by gum-cypress swamp forest.

MCLEOD, KENNETH W. Savannah River Ecology and University of Georgia--
Contribution of a nuclear fuel chemical separations facility to the plutonium concentration of tobacco.

It is becoming evident that the major health hazard to man from alpha-emitting radionuclides is via the inhalation pathway rather than by ingestion. This is due primarily to the low gut absorption rates of these radionuclides. Inhalation of alpha-emitting radionuclides by man could occur during residence or while conducting agricultural operations in a contaminated area. This would contribute to the dose of only a very limited portion of the population. One potential means of exposing a much larger segment of the population to this type of radiation might be inhalation of smoke from tobacco products which contain plutonium. Tobacco leaves grown in the immediate vicinity of a chemical separations facility at the SRP were shown to have 10x greater Pu concentrations than areas receiving only global fallout. Leaves harvested early in the growing season had greater Pu concentrations than those harvested at later times. Stem tissue had lower concentrations than all leaves. Plutonium isotopic ratios ($[Pu-238] / [Pu-239,240]$) are approximately 2.0 in samples from near the facility and 0.5 in control samples. This difference in isotopic ratio also indicates a Pu-238 contribution from the separation facility. Implication to the resultant dose-to-man will also be discussed.

MELlichamp, T. LAWRENCE, Univ. of N.C.
at Charlotte--Astilbe crenatiloba: Extinct or non-existent?

Astilbe crenatiloba (Britton) Small (Saxifragaceae), the Roan False Goatsbeard, was collected by N.L. Britton in 1886 on "the slopes of Roan Mtn., Tenn. & N.C." and has not been seen alive since. It is listed as extinct on the N.C. state and the federal endangered and threatened plants lists. Repeated searches have failed to discover any populations. The species grew along the Doe River gorge going from the town of Roan Mtn., TN, up the western slopes of the 6,000' Roan Mtn. on the TN-NC border, as described by Britton in a report published in 1888. We believe we have found the most likely location where this Astilbe could have grown (a rich, north-facing wooded slope) along the road that would have been traveled by Britton, but the plants there now are only Astilbe biternata. The only physical evidence for the existence of Astilbe crenatiloba is two herbarium specimens at the N.Y. Botanical Gardens collected by Britton in 1886, one of which is designated the holotype. There are distinctive characters of fruit, seed, and leaf that identify these specimens; but without living populations to study, we have no way to absolutely confirm its validity as a species.

MELlichamp, T. LAWRENCE & JAMES F. MATTHEWS. University of North Carolina at Charlotte.--Introgressive Hybridization in a piedmont population of pitcher plants (Sarracenia).

Several unusual upland Piedmont populations of the pitcher plants, Sarracenia flava and

S. purpurea, have been found in Montgomery Co., N.C. The relatively restricted populations occur on Kirksey soil in areas of water seepage which maintains constantly high soil moisture. One population of Sarracenia contains both species and a number of interspecific hybrids. Casual observations have revealed intergrading forms and probable backcrosses which were initially described as a classical hybrid swarm. However, some of the presumed parents appear to be atypical for key species characters. Measurements of inside-hood hair length and pitcher orifice circumference ratio suggest introgression whereby characteristics of S. flava are noticeably shifting the phenotypic expression of characters in the sympatric S. purpurea population. Other populations of S. purpurea from the piedmont and coastal plain have been similarly measured to describe a "typical population" by which to compare the alleged introgressed population.

MILLER, GROVER C. North Carolina State University--Longevity of a Strigeoid Trematode, Pharyngostomoides procyonis, in the Raccoon.

An adult male raccoon, naturally infected with P. procyonis, was trapped and maintained in this laboratory on an artificial diet until it died July 27, 1979. During this period of 11 years, 2 months a small number of P. procyonis ova continued to be present in the feces. Death of the host appeared to be due to old age and pneumonia. At necropsy 5 adult P. procyonis were recovered although the worms appeared abnormal. A female raccoon trapped on Feb. 9, 1969 and maintained the same way still has eggs in the feces after nearly 13 years. These two raccoons provided us with 25 progeny for studying transmammary transmission of this parasite (Parasitology 82, 335-342). Our studies indicate that the raccoon is infected for life.

MILLS, RICHARD R. and T. DANIEL KIMPROUGH. Virginia Commonwealth University--Bursicon induced stimulation of blood cell protein kinase by the American cockroach.

The peptide hormone, bursicon, mediates the sclerotization of the cockroach cuticle. In this study, it has been shown that bursicon stimulates adenylyl cyclase receptor sites on the haemocyte (blood cell) membrane which subsequently activates the synthesis of cyclic AMP. The cyclic AMP, in turn, acts as cofactor to stimulate protein kinase for phosphorylation of specific proteins. It has been previously shown that tyrosine is metabolized to N-acetyldopamine and the latter compound is incorporated into a protein bound matrix. This matrix is responsible for cuticle sclerotization. Additional work presented here provides evidence that cyclic AMP stimulates the uptake of tyrosine into the blood cell. It is suggested that bursicon activates the synthesis of cyclic AMP which stimulates phosphorylation of specific proteins.

These proteins in turn, are incorporated into the membrane which speeds up tyrosine transport into the cell for subsequent metabolism to N-acetyl-dopamine.

MITCHELL, SANDRA L. Mississippi State University--Feeding ecology of *Sooglossus gardineri* (Sooglossidae: Anura).

The Seychelle Islands comprise a unique archipelago of mid-oceanic granitic islands in the Indian Ocean east of Kenya, Africa. Endemism, including the frog family Sooglossidae, is high. *Sooglossus gardineri*, the smallest and most numerous of the three species in the family, is among the smallest frogs in the world. Adults average 10.9 ± 1.2 mm snout-vent length. These terrestrial frogs have direct-development and occur under surface objects and within the leaf litter on the floor of montane forests (420-620 m elevation). The contents of 186 specimens collected throughout a year from the adjacent islands of Mahe and Silhouette were tabulated and identified. Food habit data were correlated with animal size, sex and season of collection.

MOBLEY, RON and G. C. MILLER. North Carolina State University--Some Digeneric Trematodes of Bolivian Bats.

One hundred bats were collected and examined during July and August 1979. All hosts were collected from forests and fruit groves in the province of LaPaz, Bolivia. Incidence and prevalence of parasitism is correlated with both seasonal influences (rainy season vs. dry season) and host feeding behavior. Comparisons are made with previous reports of digeneans recovered from bats collected during the Ecuadorian rainy season.

MULLIGAN, TIMOTHY J. and FRANKLIN F. SNELSON, JR. University of Central Florida--Summer-season populations of epibenthic marine fishes in the Indian River lagoon system, Florida.

Epibenthic marine fish populations were sampled in order to establish quantitative baseline data for use in long-term monitoring of the northern Indian River lagoon system, Florida. Fish samples were taken by trawling monthly at 8 fixed stations from June through September, 1979 and 1980. Fifty-seven fish species representing 29 families were identified from the collections. The fish community was numerically dominated by a very few species. *Anchoa mitchilli*, alone, accounted for 87% of the 105,853 individuals collected. Abundance, dominance, and species diversity were compared among the three lagoon subdivisions, Mosquito Lagoon, Indian River, and Banana River. Greater numbers of fishes were collected in the Indian River, while the highest diversity levels were in the Banana River. Although most species were collected in all three subareas, gross inequities occurred in the numbers of individuals taken. For example, Mosquito Lagoon produced significantly more *Micropogonias undulatus* and

Leiostomus xanthurus than either the Indian or Banana rivers. The only measured environmental parameters that appeared to play significant roles in determining fish populations were vegetative cover and salinity. An importance value (IV) index, combining relative abundance, relative frequency of capture, and relative size (biomass) per individual, was calculated for each species in the community. Dominance ranking by IV has advantages over dominance ranking by relative abundance alone and is valuable for making comparisons in a long-term monitoring program.

MURPHY, GINGER A. Eastern Kentucky University--Characteristics of red-cockaded woodpecker (*Picoides borealis*) cavity trees in Kentucky.

Characteristics of red-cockaded woodpecker (*Picoides borealis*) cavity trees located on the Daniel Boone National Forest were evaluated, including cavity tree species, age, diameter breast height (dbh), and condition; the number of cavities per tree and the total number of cavity starts; and cavity heights and aspects. Eighteen of 30 cavity trees were shortleaf pine (*Pinus echinata*). Trees of all species averaged 116.2 years of age and 43.7 cm dbh. Sixteen trees were clearly infected with red heart fungus (*Phellinus pini*). The average number of cavities per tree was 1.33. Five cavity starts were observed. Cavity heights averaged 12.9 meters. Fifty-seven percent of all cavities were oriented in a westerly direction. Data were compared with several similar studies. Differences in tree species, age and condition existed, primarily because of differences in Kentucky forest characteristics and project methodology. Management recommendations include maintenance of an 80-year pine rotation, preservation of all pines within designated buffer zones as replacement cavity trees, and protection of diseased trees within managed acreages to encourage the spread of red heart fungus.

NELSON, DIANE R.,¹ ROBERT O. SCHUSTER,² and A. A. GRICARICK.² East Tennessee State University¹ and University of California at Davis²--Heterotardigrada of Northern Venezuela.

Few extensive surveys of the tardigrade fauna of South America have been conducted, and no previous reports of Venezuelan tardigrades have been published. In June-July 1979 an entomological survey team from the University of California at Davis collected moss, liverwort, and lichen samples from several localities in northern Venezuela. The plant samples were stored in paper bags and later processed to remove tardigrades. Specimens were slide-mounted in Hoyer's or critical point dried and sputter-coated for analysis with an FTEC scanning electron microscope at UC-Davis.

Fourteen species of the Class Heterotardigrada were present in the samples: one species of Oreella, Mopsechiniscus, and Bryodelphax; two species of Pseudechiniscus; and nine species of Echiniscus. Of the 14 species, six are considered to be previously undescribed: one species of Oreella and Bryodelphax; two species of Echiniscus in the spinulosus species complex; and two species of Echiniscus in the arctomys complex. Variability in taxonomic characters was analyzed with phase and scanning electron microscopy, and species/ habitat/ locality associations were examined.

NESOM, GUY L. Memphis State University--
Fruit structure, seed release, and seed dispersal in species of Trillium.

Fruits of Trillium have been described in the literature either as berries or capsules, mostly the former. In many cases, this apparently has been due to lack of actual observations of the mature fruits and the mechanisms of seed release and dispersal. Field and lab studies of sessile-flowered species from the eastern and western U.S. have made possible several generalizations regarding this group. (1) All apparently have a "soft capsule", released from the receptacle by a regular basal abscission; in some species, seeds exit through the basal opening, but in others, septicial dehiscence of the pericarp occurs, although this may be delayed until after abscission of the entire fruit. (2) Placentation in some species is axile, in others parietal; others show an intermediate condition. (3) Pericarp walls vary among species from thick to thin; wall color varies from white to greenish to red or purple. Observations also have been made of species of pedicellate-flowered Trillium; some have soft capsules, basically similar in structure and function to those in sessile-flowered species, but others have true berries. Seeds of all species in the genus have elaiosomes; all observed released from capsules are ant-dispersed. Some of these observations have significance in a reconstruction of the phylogenetic history of the sessile-flowered species as well as the whole genus, currently in progress (with T. Patrick). Of critical importance for interpretation are further observations of the pedicellate-flowered species, where a greater range of variation exists in fruit and seed mechanisms, and of the species of Paris, the sister genus of Trillium.

NEWSOME, ANTHONY L. AND WALTER E. WILHELM. Memphis State University--Effect of exogenous iron and iron chelators on the viability of pathogenic Naegleria fowleri.

When Naegleria fowleri (Lee) was incubated in newborn calf and human serum an amebicidal effect was observed. Heat inactivation of both sera resulted in the recovery of viable amebae after incubation in these sera. Exogenous iron greatly enhanced growth and/or via-

bility in heat inactivated calf serum. When human serum was heat inactivated and the pH lowered in conjunction with iron supplements, the viability of amebae was also enhanced. In a second series of experiments organic and synthetic iron chelators were evaluated for their in vitro effect on Naegleria in serum and culture media. An inhibitory effect was particularly apparent with a synthetic iron chelator. The inhibitory effect was apparent after 24 hr incubation in culture media and calf serum. With increased time the inhibitory effect became more pronounced and no viable amebae were recovered from serum after 24 hr and after 48 hr from culture media. The apparent inability of Naegleria to use this chelated iron suggests that such compounds could be of value in understanding the role of iron as an essential nutrilit and conceivably might be of therapeutic value in the treatment of Naegleria infections.

MEENEIER, SUE E. and ROBERT A. YOUNG, Southern Illinois University--Comparative analysis of leaf protein from five populations of Crotalaria sagittalis L.

Previous studies indicate that populations of C. sagittalis from environmentally diverse locations exhibit morphological as well as physiological variation when grown under uniform conditions. To determine if any relationship exists between protein profile and geographic location, leaf tissue from five populations was compared. Proteins were extracted from homogenized leaf tissue with acetone. The acetone powders were treated with .01 M phosphate buffer and freeze-dried. Proteins were electro-focused utilizing 1400 volts, 20 milliamps, and 8 watts for one hour on 5% polyacrylamide gel plates with a pH gradient of 3.5-9.5. Differences in protein profiles were primarily quantitative with the Iowa population having the least amount of leaf protein. Most protein components of all five populations had pI values centering around 8.3, with a prominent fraction appearing at the 8.7 region of the gel. Total number of components ranged from eight in the South Carolina population to 14 in the Illinois population. A single component unique to the Mexico population had a pI value above 8.7.

NUGEN, CHARLENE and DONALD C. TARTER. Marshall University--Larval Hydropsyche and Symphitopsyche records in West Virginia (Trichoptera: Hydropsyichidae).

A survey of the larval Hydropsyche Pictet and Symphitopsyche Ulmer of West Virginia included fifteen species, eleven of which were state records. Two species groups were also found in the state possibly adding four more species to the list. Distribution of large and small stream species in the state was consistent with previous literature findings. Important range extensions for the United States included Symphitopsyche macledoi (Flint), S. ventura (Ross), Hydropsyche leonardi Ross, and H. hoffmani Ross.

O'Bara, Christopher J., R. Don Estes, and William P. Bonner. Tennessee Technological University--The Effects of Land Practices on the Water Quality and Fish of Sixteen Streams in the Big South Fork National River and Recreational Area, Tennessee and Kentucky.

Water quality and fish were collected in sixteen tributaries of the Big South Fork of the Cumberland River during the summer and fall of 1981. Streams varied from first to fourth order. Two were classified as cold-water and the remainder as warmwater streams. Seventeen water quality parameters and substrate were analyzed twice to determine the degree of perturbation on the abiotic environment. Fish communities were sampled once utilizing standard techniques. A wide range of land practices were evident in the watershed. Acid mine drainage from surface and deep mines had the most severe effect on the fish fauna and in some cases completely eliminated the organisms. A negative correlation was found between increasing iron and aluminum concentrations, indicative of acid mine drainage, and decreasing species richness, fish population and standing crop in receiving streams. Other land practices detrimental to the fish fauna included road construction; domestic, industrial and agricultural pollution; stream channelization and oil exploration.

OGLE, DOUGLAS W. Virginia Highlands Community College--Phytogeography of *Vaccinium macrocarpon* Alton in the Southeastern United States.

The extant distribution of *V. macrocarpon* (Large Cranberry) in the southeast originated during glaciation and is maintained by specialized climatic and site conditions. The cranberry is a coastal plain-mountain disjunct found in wetlands under a wide latitude of temperature ranges with many different potential competitors. Environmental demands are met with an array of growth and reproductive possibilities, several dispersal methods, and by association with *Sphagnum*. Growth and reproductive patterns are determined by site conditions and competition. Dispersal is primarily accomplished by birds, but water dispersal is possible. Man seems to be relatively unimportant in dispersal but quite important in habitat modification. Topographic patterns associated with movement, temperature, and precipitation of both continental polar and maritime tropical air masses, and those associated with restricted drainage are correlated with mountain stations. *Sphagnum* enhances the microclimate supporting *V. macrocarpon* by influencing acidity, moisture, and air/water temperatures. The cranberry is considered either endangered or threatened in four states and the most critical threat appears to be draining and utilization of wetlands for farming or recreation.

O'KELLEY, J. CHARLES. The University of Alabama--Zygote production in *Chlorococcum echinozygotum* Starr.
Zygote production in *C. echinozygotum* has

been studied in several media in which the organism grows well. One medium was more suitable for zygote production than others tested. This medium contains NaNO_3 at a conc. of 1 mM/liter. Maximal vegetative growth, as turbidity, occurred at a nitrate level of 2 mM/liter, but the maximal number of cells produced occurred at 1 mM nitrate. The highest proportion of zygotes to vegetative cells occurred at 0.2 mM nitrate/liter. This level of NO_3 was optimal for zygote production in a second medium tested. When urea or NH_4 were substituted for NO_3 as sole N source, optimal N level for zoospore production was still 0.2 mM/liter. Varying light intensity, from 57 to 230 ft.-ca., had no effect upon proportion of zygotes, and removing blue light from the incident spectrum was also without effect. Diminished levels (below that optimal for vegetative growth) of Ca, Mg, S, K and PO_4 had no stimulatory effect upon zygote production.

Oskins, Wanda S. Southern Illinois University--The water dynamics and flora of Big Oak Tree State Park, Missouri.

This study addresses concerns dealing with the floristic composition of a 1000 acre tract of primeval Missouri swampland and mature bottomland forest. Prior to pre-settlement, more than 50,000 acres in the Missouri bootheel were swamplands. Less than half of the original acreage remains and Big Oak Tree, like other small remaining tracts, is encroached upon by agricultural holdings. Located less than two miles from the Mississippi River, channelization and levee projects in and near the park have created a dynamic hydrologic system incomparable to that of the pre-channelization era. An increasing beaver population has further complicated the complex water dynamics. Management goals are to restore the vegetative communities to conditions reminiscent of pre-settlement times. Methods include documentation of the existing flora, measurements of the fluctuating water dynamics, anatomical analysis of tree core samples, and baseline measurements of species diversity. Upon completion (1982), viable swampland management strategies should be forthcoming. Research in cooperation with the Missouri Department of Natural Resources.

PALMER, JACQUELINE M. Western Carolina University--Cytochemical observations of silk glands in the primitive spiders *Anthrodiaetus unicolor* and *Liphistius desultor*.

Specimens of *Anthrodiaetus unicolor* and one individual of *Liphistius desultor* were fixed in ethanol-acetic acid (3:1), embedded in Paraplast-plus and serially sectioned at 7µm. Silk glands were studied using a variety of absorption and fluorescent cytochemical techniques. *A. unicolor* spinnerets are served by four clusters of small, oval glands which are all alike histochemically and in size and shape. Consequently, *A. unicolor* is one of the few spiders known to possess only one kind of silk gland. Each *A. unicolor* gland secretes two types of protein into its lumen, basic protein being produced by cells of the distal hemisphere

and acidic protein characterized by numerous C-terminal carboxyl groups being secreted by the proximal hemisphere. Preliminary observations of *Liphistius desultor*, the most anatomically primitive extant spider, also show silk glands secreting different products in distal and proximal regions. In addition, cells in one hemisphere produce chemically complex secretory vesicles. The product within these vesicles appears also to be "polarized" and is composed of at least two chemically distinct components.

PARR, PATRICIA DREYER and FRED G. TAYLOR, JR. Oak Ridge National Laboratory--Germination and growth effects of hexavalent chromium in Orocol TL on Phaseolus vulgaris.

The potential for germination and growth effects in bush beans from hexavalent chromium in Orocol TL, a proprietary chromated, zinc-phosphate compound added to Department of Energy cooling water systems for corrosion inhibition was assessed. Studies were conducted at low and high Orocol TL concentrations (0, 10 and 500 µg/g Cr) in the soil by adjusting soil pH (4-4.5, 5-5.5, and 6.5-7) and the percent organic matter (1.8, 3 and 5%). High levels (500 µg/g) of hexavalent chromium in soil affected germination and growth, while a high level of organic matter significantly reduced chromium toxicity on germination. At lower chromium concentrations there was a significant uptake by all plant parts, with a corresponding reduction in leaf biomass regardless of soil pH or organic matter adjustment. While this study was specific for cooling towers and chromated drift, the results have generic application for any technology where the release and subsequent deposition of chromated residuals potentially interact with soils and vegetation. Research sponsored by the Office of Health and Environmental Research, U.S. Department of Energy, under contract W-7405-eng-26 with Union Carbide Corporation.

PATRICK, THOMAS S. University of Tennessee--The use of pollen sculpturing to determine relationships in Trillium. The genus *Trillium* (LILIACEAE) is divided into two morphological groups based on the presence of a pedicel. Samples of pollen from both groups were observed with an SEM. Pollen of a few species in both groups is similar. It is evident, however, that each *Trillium* group eventually underwent its own course of elaboration with regard to exine patterning. The sessile-flowered taxa show a great diversity with some unique patterns with obscure relationships. Some species display sculpturing that resembles that of the *T. erectum* complex of the pedicellate-flowered group. This same patterning shows up in the eastern Asian taxa as well. Some subtle changes are found within complexes, such as both the trend toward less round, smaller grains and the tendency for a more uniform adornment seen in the *T. erectum* complex. Combined data on pollen, fruit structure, flavonoids and geographic range substantiate the idea that *T. erectum* may not be a primitive member of the complex

and, furthermore, that it should be treated as a species distinct from other advanced taxa found in the mountainous areas of the Southeast. Pollen sculpturing, then, seems useful in the delimitation of certain taxa, but isolated species often have such unique pollen that interspecific relationships are difficult to perceive.

PATTERSON, K. K. and J. W. GIBBONS. Savannah River Ecology Laboratory--The abundance and diversity of herpetofauna utilizing a southeastern stream and floodplain.

A post-thermal recovery stream on the Savannah River Plant near Aiken, SC, has a large resident community of reptiles and amphibians utilizing the channel, floodplain and stream delta. The presence of more than 60 species has been verified. Species abundance and diversity along the creek may be attributed to abundant food resources, suitable breeding sites, adequate cover, a great variety of habitat types in a small area, or features of the stream system unique to its post-thermal character.

PATTON, SHARON. University of Tennessee Veterinary College--Enzyme-Linked Immunosorbent Assay in the Diagnosis of Occult Dirofilaria immitis in Dogs.

Diagnosis of *Dirofilaria immitis* infections are made with certainty only in those cases where characteristic microfilariae are found. Infections without circulating microfilariae (occult infections) are a diagnostic problem. The purpose of this study was to measure the specificity and sensitivity of ELISA for canine filariasis in a population of naturally exposed dogs and to determine if ELISA would detect occult heartworm infections. Sera were collected from the clinic dog population. The antigen was a soluble extract of adult *D. immitis*. A total of 103 dogs were studied. Each dog was assigned to one of four groups based on history, clinical, and laboratory findings. The amount of circulating antibody in unexposed dogs (Group A) was lower and significantly different than that in dogs with a microfilaremia (Group B). The amount of antibody detected in dogs with a previous heartworm infection (Group D) was higher but not significantly different than in Group A and lower but not significantly different than in Group B. The highest titers were from dogs with occult infections (Group C). The results indicate that ELISA is helpful in diagnosis of occult dirofilariasis particularly when titers are correlated with the history of the dog, clinical and laboratory findings.

PATTON, SHARON and SANDRA STRAWBRIDGE JOHNSON. University of Tennessee Veterinary College--Preliminary Survey of Parasites in Dairy Goats in East Tennessee Based on Fecal Examinations.

In the summer of 1981, parasites were an important cause of illness and death in Tennessee dairy goat herds. To better understand this problem, fecal samples were collected from 109 goats on 8 farms in East Tennessee.

Age, sex, breed, general health and anthelmintic treatment history were obtained for each goat sampled. Information on management of the goats and farms were recorded. Fecal samples were collected either immediately after defecation or from the rectum of goats considered representative of animals in the herd. Samples were examined by Sheather's sugar flotation, McMaster and Baermann techniques. *Strongyloides* eggs (300-4400 eggs/gm) and *Eimeria* oocysts (50-71,400 oocysts/gm) were present in 13% and 86% respectively of the samples from goats under 12 months. *Eimeria* oocysts (50-1400 oocysts/gm) were in 73% of the adults. *Trichostrongyle* eggs were in 91% of the adults (50-41,500 eggs/gm) and 81% of the kids (50-2850 eggs/gm). *Trichuris*, *Capillaria*, and *Moniezia* eggs were in 6%, 3%, and 15% of the samples respectively. Seven of the herds examined were infected with the lungworm *Muellerius capillaris*. *Muellerius* larvae were found only in goats over 4 months old. Thirty-four percent of these goats were infected.

PENNINGTON, SAM N., KALMUS, GERHARD W. and BOYD, JOHN W. East Carolina University--The fetal alcohol syndrome and brain cAMP: The influence of varied ethanol concentrations on cAMP levels in the chick embryo brain.

Embryonic development is known to be retarded when the embryo is exposed to ethanol. Ethanol exposure during gestation causes significant central nervous system dysfunction. Cyclic 3',5'-adenosine monophosphate (cAMP) is known to regulate many enzyme systems. Cyclic AMP is thought to play an important role in cell differentiation, growth, regulation of brain protein synthesis and many other metabolic events. Experimental chick embryos were dosed on initial incubation via the airspace with various ethanol concentrations. Controls were dosed with vehicle. After 10 days of development, cAMP whole brain levels were quantified with radioimmuno techniques. Results indicate a positive dose response correlation between ethanol concentrations and cAMP levels. Ethanol induced elevations in cAMP levels may play an important role in the control of brain cell differentiation. Research funded in part by Sigma Xi.

PENNINGTON, SAM., KALMUS, GERHARD W. and WILSON, ROBERT W. East Carolina University--Characterization of liver alcohol dehydrogenase in the developing chick embryo.

Suppression of growth rate in the fetus has been observed in women who drink ethanol during pregnancy. The molecular mechanisms responsible for this growth retardation are not understood. It remains to be determined whether developmental abnormalities are the result of the direct action of ethanol or its metabolites on embryonic tissue. The embryo's ability to metabolize and eliminate ethanol was determined by obtaining data for the specific activity and activity per gram liver of liver alcohol dehydrogenase (ADH). Enzyme kinetics (K_m ,

V_{max}) were also recorded. Electrophoresis was performed to detect ADH isoenzymes. Results indicate that prior to day 9 of incubation, the developing embryo has undetectable levels of ADH and thus appears to clear ethanol by gas exchange. Total liver ADH activity increases after day 9 of incubation. K_m , V_{max} , and electrophoretic data imply that inhibitors and ADH isoenzymes effect the ethanol metabolizing ability of the developing embryo. Prior to day 9, the direct biochemical effects of ethanol may be measured without the complication of oxidation to metabolites (i.e. acetaldehyde). Developmental kinetics resemble published values for mammalian ADH.

PERRY, JAMES D. University of North Carolina at Asheville--Evidence of hybridization in Georgia Piedmont horse-weeds.

Conyza canadensis var. *canadensis* (Asteraceae) assumes dominance in many first-year abandoned fields of the Piedmont and Blue Ridge provinces of Georgia and elsewhere. In the Coastal Plain *C. canadensis* var. *pusilla* is dominant, but its range extends into the Piedmont and occasionally it is found in the mountains. Population samples reveal the presence of intermediate forms in the Piedmont, and this study was done to determine the relationship of the two taxa. The varieties ordinarily self-pollinate, but outcrossing is not precluded. Chromosome number in both is $n=9$. Nearly 2000 plants were sampled systematically with regard to height, stem and leaf vestiture, leaf length, width, and margin type, phyllary length and color of tip, and time of anthesis. The intermediates, or putative hybrids, show various combinations of traits. Hybrids have been produced by artificial crossing; these are in part similar to intermediates encountered in the field. It is clear that hybridization does occur in areas of range overlap, but the two taxa remain distinct because of predominance of self-pollination. While in the past they have been given specific rank, the varietal status recognized by recent workers seems most appropriate.

PERSCHBACHER, PETER W.¹ and FRANK J. SCHWARTZ.² Texas A&M University¹ and Institute of Marine Sciences, University of North Carolina²--Occurrence and ecology of four species of Anchoa in the Cape Fear River and adjacent Atlantic Ocean, North Carolina region 1973-1978.

Four species of anchovies, in order of abundance, *Anchoa mitchilli*, *A. hepsetus*, *A. cubana*, and *A. nasuta* were captured between 1973 and 1978 in the nearshore ocean region of the Cape Fear River while three species, *A. mitchilli*, *A. hepsetus*, and *A. nasuta* were collected in the estuarine portion of the river. *A. mitchilli* occupied waters of

5.7-31.0°C and salinities of 25.0-34.4 ppt. A. hepsetus frequented waters of 7.0-31°C while A. nasuta and A. cubana were collected in waters of 14.7-31.0°C and 20.7-27.1°C, respectively and similar salinities. Capture of A. cubana, during three separate sample years, substantiated its northward range extension to North Carolina. Collection of three gravid A. cubana females and two ripe males off Shackleford Banks, North Carolina, in July 1976, suggested spawning also occurred within state waters. A. mitchilli was most abundant throughout each sample year in January, February, April, and June. A. hepsetus and A. nasuta were collected annually in nearshore waters beginning in February and April respectively. A. hepsetus was most abundant between May to September and November, A. nasuta in April and September. A. cubana was collected only in the ocean from September through November, with highest catch per unit effort occurring in October.

PETERSEN, RAYMOND L., WILLIAM C. THORNE, and W. LENA AUSTIN. Howard University--Effects of Cytochalasin B on Physarum polycephalum.

The acellular slime mold, Physarum polycephalum was exposed to various levels of Cytochalasin B, a fungal product, with the marked ability to disrupt such cellular processes as cyclosis and cell division, as well as disrupt morphogenesis. Cytochalasin B affected P. polycephalum by changing the frequencies of its pulse beat, inhibiting its growth, and either resulting in the production of malformed sporangia or completely preventing their production.

PETRANKA, JAMES W. University of Kentucky--Fish predation: a factor affecting the micro-distribution of a stream-breeding salamander.

Four lines of evidence support the hypothesis that fish predation restricts larvae of the small-mouthed salamander, Ambystoma texanum, to fishless portions of streams; 1) a significant negative correlation exists between the distributions of salamander larvae and fish surveyed in 112 streams, 2) larvae were readily consumed by 6 of 8 fish species in the lab, 3) the number of larvae observed in 3 study pools over a 3-year study period was extremely low during years when fish were present compared to years when fish were absent, and 4) salamander larvae became abundant in downstream portions of a study stream after a fish kill eliminated predatory fishes from the stream.

PHIFER, CURTIS X. and DAVID J. PRIOR. University of Kentucky--Dehydration induced reduction of feeding behavior in Limax maximus.

The gastropod mollusc, Limax maximus, is

subject to dessication due to its terrestrial existence and lack of a protective shell. Feeding behavior appears to be detrimental to dehydrated slugs because water is used in digestion. Furthermore, the time spent feeding could be spent seeking water. Behavioral and electrophysiological experiments have shown a reduction in feeding responsiveness in dehydrated slugs which appears due to increased blood osmolality. Slugs dehydrated by exposure to a drying environment are less likely to feed than non-dehydrated slugs. Slugs also exhibit reduced feeding after receiving injections of concentrated mannitol solutions calculated to increase a slug's blood osmolality from the normal 140 milliosmoles/kg H₂O to 190-200 milliosmoles/kg H₂O which approximates a 30% dehydrated slug. The feeding motor program (FMP) is a pattern of rhythmic neural activity which can be recorded from an isolated brain preparation and has been correlated with salivation and feeding movements of the buccal mass. The duration of FMP sequences is significantly decreased when the brain is bathed in concentrated saline. These results suggest a control of central nervous system activity by environmentally induced changes in internal fluid. (Supported by a grant from the Whitehall Foundation.)

PHILLIPPI, ANN and ART BOEBINGER.

University of Kentucky and University of Tennessee--A vegetational analysis of three small watersheds in Robinson Forest, Breathitt County, Kentucky.

Density (D), frequency, basal area (BA), and importance values (IV) were determined for tree species and frequencies were determined for shrub/sapling and herbaceous species on 65 randomly chosen 0.04 ha plots in Robinson Forest, a 6075 ha experimental forest in eastern Kentucky owned and operated by the University of Kentucky Agricultural Experiment Station. Miller Branch watershed (127 ha, n=30) yielded 26 tree species (D=425.5 stems/ha, BA=36.7 m²/ha) with Quercus velutina, Liriodendron tulipifera, and Fagus grandifolia having the highest IVs. Falling Rock (93 ha, n=25), the control watershed for Robinson Forest, also yielded 26 tree species (D=349.7 stems/ha, BA=43.6 m²/ha) with Quercus alba, Tsuga canadensis, and Quercus velutina having the highest IVs. Field Branch watershed (40 ha, n=10), scheduled to be clearcut in July 1982, yielded 22 tree species (D=486.5 stems/ha, BA=29.1 m²/ha) with Liriodendron tulipifera, Quercus alba, and Tsuga canadensis having the highest IVs. Comparison of shrub/sapling data with earlier regional and local studies indicate a trend toward increased numbers of shade-tolerant tree species and a decrease in shade-intolerant species which now dominate. These findings add to the meager descriptive information on Kentucky forests and form a base line for anticipated experimental studies in a region constantly threatened by massive surface mining. Transportation provided by the University of Kentucky Department of Forestry and the Kentucky Nature Preserves Commission.

PHILLIPS, ANDREW and RAYMOND L. PETERSEN. Howard University--Effects of heavy metal ions on fern and moss gametophyte growth and development.

The effects of the divalent ions of Hg, Cd, Cu, and Zn were treated on the development systems of the fern, *Onoclea sensibilis*, and the moss, *Polytrichum commune*, gametophytes. In the fern inhibitions in cell divisions, one-to-two dimensional growth transition, gametangia formation, and sporeling production were detected. In the moss inhibition in cell division and bud formation were detected. Cu was the most toxic of the ions tested, followed by Hg, Cd, and Zn. The moss was more sensitive to heavy metals than the fern.

PHILLIPS, DONALD L. Emory University--Water potential of *Viguiera porteri*: endpoint recognition in pressure bomb determinations.

During water potential determinations of *Viguiera porteri* (Asteraceae) using a Scholander pressure bomb, a somewhat viscous fluid was exuded around the stem periphery at very low pressures. With increasing pressure, large bubbles formed until at some higher pressure, the bubbling suddenly changed to a white froth upon the apparent exudation of a second sap. The viscosity of the first sap and its appearance at very low pressures even in wilted plants rules out its being xylem sap. Osmotic potential determinations of the second sap were within the range reported for xylem sap. The appearance of the second sap at the onset of frothing was shown to represent the true balancing pressure by comparison with dewpoint hygrometer determinations of leaf water potential. This pattern was not exhibited by older, more fibrous stems which: (1) showed increased sclerification in the cortex and inter-fascicular regions; (2) had a reduced number of glandular hairs; and (3) could be compressed more tightly without severing the stem.

PHILLIPS, DONALD L. Emory University--Granite outcrops: an analysis of plant life-forms.

Life-form spectra of granite outcrop floras are significantly different from the spectrum of the southern Piedmont in which they occur. They are significantly less hemicryptophytic and more therophytic, and approach spectra of desert areas such as Death Valley, California. These differences are attributed to the high maximum temperatures, shallow soils, and low water availability which characterize the microenvironment of the outcrops.

PILATOWSKI, RONALD E. The Ohio State University--Chemical variation in *Aesculus glabra* L. and *A. octandra* Marsh. (Hippocastanaceae).

Aesculus glabra L., Ohio buckeye, normally found in the area of Wisconsinan glaciation, and *Aesculus octandra* Marsh., the Yellow buckeye distributed throughout the Southern

Appalachians, are known to hybridize where their ranges overlap in southern Ohio. Morphological intermediates can be identified only in flower or fruit, leading to difficulty in distinguishing the hybrids and the introgressants in the field. Leaf flavonoids were examined to determine whether or not these compounds could be of use in documenting hybridization and introgression in these taxa. A complement of Quercetin-3-O-Glycosides occur in the taxa. Consistent and characteristic patterns were obtained for each species, but no variation was observed in the morphological intermediates. Seven isozyme systems were examined to determine whether species specific eletromorphs could be detected. The systems used were: GOT, LAP, PGM, PGI, ADH/GDH, SDH, and MDH. Distinctive banding patterns were obtained for the two species. Variation was observed within populations of both taxa. More importantly, additive banding patterns were obtained for plants occurring in the area of sympatry of *A. glabra* and *A. octandra*. These data are significant in light of the paucity of isozymic information for woody plants.

PRATT, JAMES R. AND JOHN CAIRNS, JR. Virginia Polytechnic Institute and State University--The rate of species export from islands: an experimental approach with protozoan communities.

The rate of accrual of protozoan species on initially barren polyurethane foam artificial substrates islands was investigated. Islands were exposed to source pool islands (epicenters) of differing maturities for 1 and 4 or 1 and 7 days. Species accumulation on islands as well as species richness of epicenters before and after exposure were measured. Numbers of species accumulating on islands was fitted to the MacArthur-Wilson non-interactive colonization model, $S = \text{Seq}(1 - e^{-Gt})$, which estimated equilibrium species numbers. Accrual of species was not dependent on the continual presence of the epicenter, although islands continuously exposed to epicenters accumulated significantly more species than those where epicenter exposure was only one day. Islands exposed to epicenters for 1 day continued to accumulate species, suggesting that propagules are produced rapidly and continually, and reach islands at different rates. Differences between island accumulation of species when the source island is continually present versus when the source is only present for 1 day relates to differing rates of propagule production, diversity of the potential propagule pool, and differences in specific migration rates.

PRIOR, DAVID J. University of Kentucky. Water Regulatory Behavior and Neuronal Tolerance to Dehydration in Terrestrial Slugs.

A fundamental problem in neuroscience is how sets of behavioral responses are modulated in concert. In order to understand this type of neural modulation we are studying water regulatory responses in terrestrial slugs. Amid the numerous water regulatory behaviors, drinking is probably the most recognized.

Osmoregulatory drinking behavior has been demonstrated in numerous vertebrate species. In these cases, loss of water through evaporation is followed by enough drinking to just replenish the loss (Fitzsimons, 1980). Several lines of evidence suggest that the stimulus for drinking is increased blood osmolality. We have discovered that slugs "drink" by absorbing water from wet substrates. Dehydrated slugs remain on a wet surface until they have absorbed enough water to return their body weight to about 80% of the original. Results from mannitol and urea injection experiments suggest that typical Verney osmoreceptors may be involved in the drinking response. Complementary neurophysiological experiments have revealed a striking tolerance of identified slug neurons to increases and decreases in saline osmolality. Intracellular microelectrode recordings have been used to assess the effects of changes in osmolality on specific electrical and chemical synaptic interactions. (Supported by National Science Foundation Grant BNS-74-15217-A01 and a grant from the Whitehall Foundation).

RAFII-TABATABAI, F. and
M. L. KENNEDY. Department of
Biology, Memphis State University--
Seasonal food habits of raccoon,
Procyon lotor in Tennessee.

Seasonal food habits of the raccoon were investigated in Tennessee by analyzing the contents of 250 gastrointestinal tracts and 34 scats. Important foods as determined by the percentage of their volume and percentage of occurrence were, in decreasing order as follows : spring foods- red mulberry, corn, insects, frogs, and birds ; summer foods- black cherry, persimmon, grapes, pokeberry, insects, crayfish, and tadpoles ; fall foods- persimmon, grapes, corn, acorns, sugar hackberry, insects, crayfish, mammals, and birds ; winter foods- persimmon, corn, sugar hackberry, acorns, mammals, birds, and insects. Seasonal food consumption by raccoons in Tennessee seems to be correlated to availability and nutritional value of the food.

RAMSEUR, GEORGE S., PAUL R. SAUNDERS, and GARRETT A. SMATHERS. University of the South, Washington State University, and National Park Service Cooperative Studies Unit--Secondary succession following fire in the Plott Balsam Mountains of North Carolina.

One of the most recent fires to disturb the intact spruce-fir forest of the Southeastern United States occurred in 1955 when a campfire escaped and burned an area of about one hectare in the Plott Balsam Mountains of North Carolina. Natural regeneration over the past 25 years includes species associated with the mature

spruce-fir forest as well as those associated with successional communities. In addition to providing clues to the pattern of succession in the Southeastern spruce-fir forest, analysis of regeneration on this site may help in understanding the origin of heath balds and grass balds.

RAYNER, DOUGLAS A. S. C. Wildlife and Marine Resources Department--Granitic Flatrock Outcrops in South Carolina: Part II.

The results of an exhaustive effort in the spring of 1980 to locate and survey granitic flatrock outcrops in S. C. were reported at the 1980 meeting of the S. C. Academy of Science. The results of a fall survey of S. C. flatrocks, begun in August and September of 1980 and completed in September of 1981, are reported here. All flatrocks more than one acre in size were surveyed; outcrops smaller than one acre and harboring both Sedum smallii and Arenaria uniflora also were surveyed. Aster avitus, the most significant of the fall flatrock "endemics," is still known only from the Pickens County locality of Clausen and Trapido (1939, Bailey Hortorium). Portulaca smallii is now known from a single small (ca. 0.1 acre) outcrop in a cow pasture in Laurens County. Portulaca coronata is now known from a large flatrock complex in Kershaw County (7 closely associated flatrocks), as well as the large flatrock complex associated with Forty-acre Rock in Lancaster County (6 flatrocks and a series of boulder outcrops). Viguiera porteri is still known from the single Spartanburg County locality found in 1972 by Clark and Childress (Converse College). Quercus georgianus apparently no longer occurs in S.C. Juncus georgianus is now known from numerous flatrocks in six different counties. The taxonomic distinctness of both Cyperus granitophilus and Panicum lithophilum are in question.

REESE, NORMAN C.,¹ WILLIAM L. CURRENT,¹ JOHN V. ERNST,² and W.S. BAILEY.² Auburn University¹ and USDA-AR.²--
Human and calf cryptosporidiosis in mice and rats.

Cryptosporidiosis is reported in a healthy 25-year-old male. Clinical symptoms include 1 day of nausea and low grade fever and 9 days of diarrhea, followed by 3 days of constipation. Oocysts of Cryptosporidium sp. were present in sugar floatations of the first fecal sample collected 56 hr. after onset of the symptoms and in daily fecal samples collected through day 12 of the illness. Oocysts of the human isolate of Cryptosporidium sp. were morphologically indistinguishable from those obtained from naturally and experimentally infected calves. After 1 week of sporulation at room temperature, oocysts from the human and from calves contained 4 sporozoites and a spherical residuum. When inoculated orally, sporulated Cryptosporidium sp. oocysts of human and of calf origin produced indistinguishable infections in suckling mice and rats and in adult mice. Reports of human cryptosporidiosis are relatively rare since positive diagnosis has pre-

viously required the finding of endogenous stages in histological sections of intestinal biopsies. The demonstration of oocysts in fecal flotations appears to be a reliable diagnostic technique. This technique was used to diagnose and monitor 2 additional cases of human cryptosporidiosis. Epidemiological data support the view that cryptosporidiosis should be regarded as a zoonosis.

RENZAGLIA, KAREN S. and TAYLOR C. SCOTT.
East Tennessee State University, and
Southern Illinois University --
Morphology and development of the stellate
gemmae of *Blasia pusilla* (Hepatophyta).

Blasia pusilla, a member of the Metzgeriales is differentiated from other simple thalloid hepatics in its prolific production of large exogenous stellate gemmae. These asexual reproductive structures are apically derived and reach a quite complex level of development before they detach and germinate. Large apical groups of essentially naked stellate gemmae are visible in the dorsally enrolled apices of many thalli. In order to determine the ontogenetic sequence in the formation of these gemmae, gemmae-producing apices were fixed and serial sectioned for light microscope observation and viewed with an ISI Alpha-9 Scanning Electron Microscope. Gemma development begins with an undifferentiated epidermal cell which divides transversely to form an upper and a lower cell, the latter of which will become the unicellular stalk. The upper cell, through a series of regular division, forms an upper filamentous region and a lower group of cells which will become the gemma apex. The upper uniseriate portion undergoes divisions only in two planes and thus forms the toothed monostromatic lamina of the gemma. The lower region next produces the first "leaf" and associated Nostoc auricle, each of which is terminated by a slime papilla. Both "leaf" and auricle are identical in structure to those of the adult plant. A second "leaf" and auricle is formed next and it is in this stage that the gemma is shed. The mature gemmae, therefore, are essentially miniature *Blasia* plants equipped with two leaves and two Nostoc-filled auricles.

REYNOLDS, JOHN D. and JOSEPH P.
CHINNICI. Virginia Commonwealth
University--Comparative infra-red
spectra of strains and hybrid
strains of *Drosophila melanogaster*.

Comparison of I.R. spectra of two genetically distinct strains of *D. melanogaster*, Florida -9 (A-9)-aflatoxin sensitive and Lausanne-S (A-11)-aflatoxin resistant revealed minor differences in peak area in the regions of 200-600 cm^{-1} , 600-700 cm^{-1} and 750-1050 cm^{-1} . Swedish-C, another strain, differed in exhibiting increased peaked area at 700 cm^{-1} , 1460 cm^{-1} , 1500 cm^{-1} , 3040 cm^{-1} , 3070 cm^{-1} and 3095 cm^{-1} . Hybrids from the cross A-9 (females) and A-11 (males) with certain chromosomal combinations were selected and crossed. The spectra of the offspring indicated significant differences in peak area 1500 cm^{-1} , 1410 cm^{-1} , 1380 cm^{-1} , 1290 cm^{-1} , 1410 cm^{-1} , 1030 cm^{-1} , 750 cm^{-1} ,

700 cm^{-1} , number of peaks-3090 cm^{-1} , 3070 cm^{-1} , 3030 cm^{-1} , and additional peaks in the region 550-350 cm^{-1} that could be used to characterize each hybrid offspring. Spectral differences could be used to distinguish between Swedish-C(*D. melanogaster*) and *D. virilis*. Flies were frozen, lyophilized and mixed with KBr powder (1 mg to 200 mg), pelletized and scanned at 60% transmission in a 283 P&E I.R. Spectrophotometer.

RISLEY, LANCE S.,¹ CLAYTON S. CIST,¹
and D. A. CROSSLEY, JR.,² University
of Tennessee¹ and University of
Georgia²--Canopy arthropod dynamics
in successional old-field and mature
forested ecosystems.

Canopy arthropods have received limited study relative to their contribution to the integral processes of forested ecosystems. It has been suggested that consumer-predator activities in the canopy serve to regulate certain forest processes. Research was conducted during the summer of 1981 at the Coweeta Hydrologic Laboratory in two primary watersheds; one a 15th year old-field succession and the other a mature hardwood forest. Canopy access was facilitated by spelunking techniques. Sample methodology included the use of collapsible bags and artificial spider webs. Bag sampled leaves and arthropods were analyzed for Ca, Na, Mg, P, and K by neutron activation and X-ray fluorescence. N was measured using the Kjeldahl technique. Leaf area and leaf consumption for *Carya* spp., *Quercus prinus*, *Liriodendron tulipifera*, *Cornus* spp., and *Acer rubrum* were measured. Artificial spider web samples were used to determine diversity. Results show increased consumption on the treated watershed with the greatest area removed in the spring. Overall consumption was within bounds determined by other investigations. The nutrient analysis values, in conjunction with consumption data, were used to evaluate canopy nutrient standing crops and pathways. Arthropod diversities were also examined.

ROBERTSON, PHILIP A. Southern Illinois
University--Effects of spring burning on
a native shortleaf pine stand in Randolph
County, Illinois.

The northwestern-most stand of native *Pinus echinata*, located in Piney Creek Nature Preserve, Randolph County, Illinois is under a program of spring burning to assess the effects of fire on regeneration of pine and associated hardwoods. Pre- and post-burn inventories were made in 1981 and 1982 using eleven 0.04 ha plots in which all individuals in the seedling-sprout, sapling and tree strata were counted. The composition of the stand is typical for the Illinois Ozarks. Following the burn, there was an overall increase of 30% in sprouts and no increase in seedlings. Sapling density, tree density and tree basal area decreased 38, 7, and 6%, respectively. Species showing significant increases in sprout density following the

burn were Acer rubrum, Carya ovalis, Cornus florida, Corylus americana, Fraxinus americana, Liriodendron tulipifera, Nyssa sylvatica, Ostrya virginiana, Pinus echinata, all Quercus species, and Vitis species. Ratios of pine to hardwood sprouts in the seedling-sprout category were 1:10.5 in the preburn to 1:14.5 in the post-burn samples, indicating an advantage for the hardwoods. However, in the sapling category, the ratios were 1:20 and 1:10 for pre- and post-burn, respectively. At this point in the burning program, pine regeneration, relative to that of the hardwoods, is not strongly enhanced by fire.

ROOKS, J. RUSSELL AND DAVID C. HEINS.
Millsaps College -- The reproductive biology of the naked sand darter, *Ammocrypta beani* Jordan, in southeastern Mississippi.

The reproduction of the naked sand darter, *Ammocrypta beani* Jordan, was studied using collections taken from the Jourdan River drainage system, Hancock County, Mississippi. We will report on the reproductive season, fecundity, and size of mature ova in *Ammocrypta beani*.

ROSS, STEPHEN T. ^{1,2} and WILLIAM J. MATTHEWS. ² University of Southern Mississippi¹ and University of Oklahoma Biological Station²--The effects of physical factors on fish community structure in Brier Creek, Oklahoma.

The south-central United States is an area with great variation in temperature and rainfall. Consequently, aquatic communities in this region may be strongly controlled by physical factors. In 1980, summer temperatures in southern Oklahoma exceeded the 15 year maximum average temperature by as much as 5°C, reaching 40.6°C in July, while rainfall in the same period was well below the 15 year average. Heat stress and crowding of fishes occurred in various localities. In this paper we assess the impact of the 1980 drought and high temperatures on fish community structure of Brier Creek, Marshall County, Oklahoma. Five stations on Brier Creek have been repeatedly sampled by ichthyologists working from the University of Oklahoma Biological Station, beginning in 1969 (Smith, L. C. and C. R. Powell. 1971. Am. Mus. Nov. No. 2458), and continuing in 1976, 1978 and 1981. The fish assemblage is composed primarily of cyprinids, percids, centrarchids, poeciliids and cyprinodontids. In 1981, headwater forms such as *Notropis boops* had declined in relative abundance, while downstream forms such as *N. lutrensis* and *L. cyanellus* increased. Species diversity for all stations combined was greatest in 1981, primarily due to the reduction in numbers of *N. boops*. Cluster analysis of stations by year (based on a correlation matrix of species abundance) showed that after 1980 headwater stations were faunistically more related to downstream stations. This is perhaps due to elimination of headwater forms and recolonization from downstream refugia.

RUFTY, LUANN and RONALD V. DIMOCK, JR.
Wake Forest University--Localization of sensory receptors implicated in the mucous trail following behavior of *Ilyanassa obsoleta*.

Ilyanassa obsoleta, the common Atlantic mud snail, follows mucous trails of conspecifics in a direction away from the trail's origin. Although the mechanisms by which snails respond to mucous trails are not fully understood, it is hypothesized that contact chemoreception by primary sense cells is involved in detection of chemical cues within the mucous trails. A study of a closely related snail, *Nassarius reticulatus*, demonstrated that sense cells were concentrated on the propodium and on the tips of the tentacles and siphon. In the present study, histological and electron microscopic techniques were employed to examine corresponding structures of *I. obsoleta*. The results of these studies suggested that the propodium may be involved in the response to mucous trails. Behavioral studies of intact and selectively ablated snails confirmed a role of the propodium in trail following behavior.

SADOWSKI, THOMAS S. Southern Illinois University--Sectional relationships of *Pithecellobium*.

The overall nature of the legume and its method of dehiscence seem to be the most reliable characters employed in segregating taxa of the Mimosoideae. Mohlenbrock segregated *Pithecellobium* and *Enterlobium* using these characters. The fruit, however, is absent from an unreasonable number of specimens, making positive identification uncertain. The classification of the subgeneric categories within *Pithecellobium* is primarily based on relatively obscure characters. A scanning electron microscopic survey of several taxa within the *Pithecellobium* complex was conducted in order to find consistent, taxonomically significant characters, and to determine whether the sections of *Pithecellobium* (*sensu* Mohlenbrock) are at the correct nomenclatural level.

SANDERS, CAROL B. AND CHARLES M. COOPER.
University of Mississippi, and USDA Sedimentation Laboratory, Oxford, Ms.--A Preliminary Study of the Pelecypod Fauna of the Coldwater River System, Mississippi.

A preliminary survey of the freshwater pelecypod fauna was conducted from January 1981 to July 1981 on the Coldwater River System of Northwest Mississippi. Fifteen species were identified. During the last decade *Corbicula manilensis*, the Asian clam, has become widespread in the State of Mississippi; specimens were found at all thirteen sites in large numbers. In addition to *Corbicula manilensis*, the next most common species in frequency of occurrence and numbers were *Quadrula pustulosa* and *Lampsilis teres anodontoides*.

SCHMALZER, PAUL A. and H. R. DESELM.
University of Tennessee, Knoxville.
Forest vegetation of the Obed Wild and Scenic River, Tennessee.

Gorges of the Cumberland Plateau in Tennessee contain forests of complex and

variable composition. Sampling of the gorges of the Obed Wild and Scenic River in the Cumberland Plateau of Tennessee has provided data from 327 0.04 ha plots. Cluster analysis was used to group these plots into types. Ten types were identified: mesic white oak, beech-tulip poplar, river birch, tulip poplar, hemlock, sweet birch, hemlock, chestnut oak-white oak, Virginia pine, white oak-scarlet oak-pine, and white pine-white oak-chestnut oak. Ordination analysis was performed using reciprocal averaging ordination and detrended correspondence analysis. Ordination of the whole data set suggested an overall moisture gradient. Correlation of ordination axis scores and environmental variables tended to confirm this interpretation. Subdivision and reordination of the vegetation data set provided further insight into the vegetation pattern.

SCHWARTZ, FRANK J. Institute of Marine Sciences, University of North Carolina--Correlation of nest sand asymmetry and percent loggerhead sea turtle egg hatch in North Carolina determined by geological sorting analyses.

Employing analysis of covariance and geological sand sorting analyses techniques, a highly significant relationship ($>1\%$) existed between percent hatch of loggerhead sea turtle eggs from Camp Lejeune, North Carolina, and sand grain asymmetry. Eggs collected in 1979 (19 nests) and 1980 (34) with their original nest sand, were artificially incubated under controlled light and temperature ($26.1\text{--}27.7^\circ\text{C}$) regimes. Following hatching, nest sands were sieved through six graded standard U.S. 10-230 mesh (2.0-.063 mm) sieves. Using geological sand sorting treatment analyses, graphic mean (M_z measures mean size), graphic standard deviation (O_I measures uniformity), inclusive graphic skewness (SK_I measures skewness or asymmetry), and K_G (measures sample kurtosis) were determined for each incubated nest sand. Slight statistical (5%) significance was found for M_z data, none for O_I and K_G observations. SK_I is geometrically independent of the sorting of the sample. The highly significant percent egg hatch and SK_I relationships were expressed by the linear regression formulas $y=32.59-89.97X$ for 1979 and $y=42.51-110.64X$ for 1980 data. In essence, sea turtles deposited and were less successful in hatching their eggs in coarser sands in 1980 than 1979. Best hatching nests were laid in sands that were retained in 60-120 mesh (.25-.125 mm) sieves. Additional analyses, throughout the loggerhead nesting range, will enhance the use of the sand sorting technique to predict best sea turtle nesting success sites.

SHARITZ, R. R., C. A. McCAFFREY, and J. B. GLADDEN. Savannah River Ecology Laboratory--Vegetation recovery patterns in a disturbed southeastern swamp forest.

The Savannah River swamp forest on the Savannah River Plant, Aiken, SC, has received hot water effluents from nuclear production reactors since the early 1950's. These thermal inputs have killed the woody vegetation in

portions of the swamp and altered the species composition in other areas. A portion of the swamp at Steel Creek has been undergoing post-thermal successional recovery for a fourteen year period since thermal inputs ceased. The present vegetation of this swamp area is a complex mosaic reflecting substrate heterogeneity and varied successional patterns. Ten vegetation types ranging from submerged rooted aquatics to forested wetlands have been described and mapped in the Steel Creek swamp. Ordination of sample plots arrayed these communities along a gradient suggestive of successional patterns reported to develop elsewhere in cypress wetlands following fire.

SHEALY, HARRY E., JR. University of South Carolina-Aiken--Henry W. Ravenel-19th Century South Carolina Botanist.

Henry William Ravenel (1814-1887) was born in St. John's Parish, Berkeley Co. near Charleston, SC and died in Aiken, SC. Throughout his life he actively pursued botany with a special interest for the cryptogams and in particular the fungi. Ravenel's contributions to botany are numerous and significant but unfortunately his historical importance as a botanist is rather obscure. He is the author of Fungi Caroliniani Exsiccati which appeared in five volumes between 1853 to 1860. Later between 1878 to 1882, with British mycologist M. C. Cooke, he issued a second series titled Fungi Americani Exsiccati which was 8 volumes or centuries. He published numerous species lists of plants found in S.C. especially those found around his lowcountry home and later those found around Aiken. Ravenel corresponded extensively with botanist of national and international prominence such as Asa Gray, John Torrey, and M. C. Cooke. Upon his death his personal herbarium included approximately 20,000 plants. The British Museum purchased Ravenel's cryptogam collection which included about 14,000 plants and his phanerogam collection consisting of about 6000 plants was donated to Converse College at Spartanburg, SC. According to one obituary by W. C. Farlow, "The name of Ravenel will be perpetuated in the genus Ravenelia of the Uredineae, a genus so peculiar in its character that it is not probable that it will ever be reduced to a synonym." This work was funded through The Faculty Exchange Program at the University of South Carolina.

SHELTON, PAUL A. Tennessee Technological University--The environmental impact of Tennessee State Route 29 upon the avifauna of adjacent lands.

Beginning in March, 1980, a thirteen month study was conducted in cooperation with the Tennessee Department of Transportation to determine the effects of newly constructed State Route 29 on bird populations of adjacent lands. This project had three major objectives: (1) to determine whether the highway affected the spacial distribution of the birds, (2) to determine which types of habitat on the study area supported the best bird populations, and (3) to compile a check list of the bird species found on

the study area. Data were gathered by the mist netting of birds, walking of line transects, and the use of the territory mapping method. Analysis of data implied that certain bird species had a tendency to avoid areas near the road, while other species seemed to be attracted to it. Areas which were physically undisturbed by the road construction tended to support better bird populations than areas which had been altered.

SHIPP, ROBERT L.¹, and ROBERT JONES²
University of South Alabama and
Harbor Branch Foundation--
Population estimates of deep water
reef fish populations by use of
visual techniques from a research
submersible.

The Johnson-Sea-Link research submersible was employed during September 1981 to census reef fish populations of an isolated patch reef of the Florida Middle Grounds, located approximately 150 km W of Tarpon Springs, FL. Reef depth ranges from 25 to 35 km. Two observers, one placed for forward observation, and the second for starboard observation, independently made relative abundance counts of reef species during 200 m transects, and numerical counts within the visual field for 10 minutes at the start and finish of each transect. Pomacentrids, especially the purple reeffish, *Chromis scotti* and the yellowtail reeffish *Chromis enchrysurus*, dominated the fish fauna immediately above the reef substrate, with the former averaging about 10 individuals/m² in most areas of the reef proper, and the latter approaching these concentrations around the deeper periphery. The striped parrotfish *Scarus croicensis* also occurred in similar concentrations in most areas. Concentrations per unit area of about sixty reef associated forms are documented by 35 mm film and videotape record.

SIMPSON, LISA B. Western Kentucky University--The effects of experimental acid rain applications on biomass and chlorophyll levels of *Xanthium strumarium* L.

Acid rain formation from atmospheric pollutants, primarily particulate sulfates and nitrates, has been shown to have at least a partial role in the decline of productivity in numerous types of regional flora. The foliage of the herbaceous species, *Xanthium strumarium* L., was treated with simulated acid rain to determine the effects of acidic pH on chlorophyll levels and biomass. The application of treatments of precipitation ranged in pH from 2.5 as the lower limit to pH 5.6 which is the normal acidity of rain. Reductions in biomass between control and experimental plants varied from a decrease of 27.6% for pH 4.5 to 21.8% for pH 2.5 and in chlorophyll measurements, decreases were

shown as 7.3% to 8.7% respectively. In each case, those plants under varying amounts of abnormal acidic precipitation showed reductions in both biomass and chlorophyll levels as compared to members of the normal rainfall group. Rainfall in Warren County, Kentucky during the summer of 1981 showed pH ranges of 4.16 to 4.85 indicating possible deposition of industrial particulates in the area.

SMALL, JR., JAMES W. and DAVID I. RICHARD.
Rollins College--Ecological Effects of
Grass Carp Introduction on a Central
Florida Lake.

Phytoplankton, zooplankton, benthic macroinvertebrates, fisheries, and several physical-chemical parameters were monitored in Clear Lake, Orange County, Florida, for one year prior to introduction of 62 grass carp (*Ctenopharyngodon idella* Val) per surface hectare. These parameters were monitored thereafter for a two year period. All submersed aquatic vegetation was eliminated within fourteen months. As vegetation was removed, water transparency decreased and turbidity, alkalinity, and chlorophyll levels increased. Both phytoplankton and zooplankton showed a diversity decrease but a simultaneous increase in the density of a few species. Cyanophytes and smaller, filter feeding zooplankters tended to dominate the plankton assemblage. Overall diversity of benthic macro-invertebrates decreased but there were increases in density of a few tolerant groups. Plankton feeding fish have tended to increase in numbers and there has been a decrease in the smaller size classes of game and forage species.

SMATHERS, GARRETT A.¹ and J. DANIEL PITTILLO.²
¹National Park Service
and ²Western Carolina University--Fog interception in the spruce-fir forest zone in North Carolina.

High-summit vegetation types of the southern Appalachians are frequently shrouded with clouds. As yet no long-term study has been done to access the fog's quantitative contribution to the water budget of these ecosystems. In May 1979, a study was initiated to determine the amount of fog interception in the spruce-fir zone (1610-1855 m) of four mountain summit areas in North Carolina. Paired Hellmann rain gauges, one fitted with a Grunow fog interceptor were placed at each site. Analysis of data through 1980 revealed that fog interception contributed from 51-94% more moisture to the forest ecosystem than that recorded by the standard rain gauge. Even during an extended drought period, fog contributed up to 80% more moisture. These percentage gains in fog moisture are the highest values recorded for similar studies in the United States. Observed patterns of fog distribution and quantities suggest that it may be an important ecological factor in determining some plant communities.

SOLOMON, JEAN A. Oak Ridge National Laboratory --Statistical analysis of a large unbalanced data set: mercury distribution in vegetation.

The mercury deposits at Almaden, Spain have been exploited for over 2000 years, making them probably the oldest and most extensive case of continuous mercury effluent to the land and air in the world. The vegetation in the surrounding area was sampled by ORNL and Minas de Almaden personnel over a period of 2 1/2 years in order to describe the resulting distribution of mercury. The data set consisted of over 2500 observations of total mercury concentration from each of 7 species, 6 tissue types, 5 collection seasons and 19 collection sites. An analysis of variance approach on the data set as a whole proved intractable due to the unbalanced nature of the collections (i.e. not all plant species grew at all 19 stations, nor did they contain the same tissue types, etc.). The approach used involved careful definition of the desired questions (e.g. do plant species concentrate mercury to differing degrees?) and subsequent selection of a balanced data subset that could address that question. A model was then employed that was specific to each question and analysis of variance (on SAS) was used to estimate the importance of each factor. Definitive answers were obtained to all questions posed, even though some of the data collected could not be used with this approach.

¹Operated by Union Carbide Corporation for the U.S. Department of Energy, under contract no. W-7405-eng-26.

STALTER, RICHARD¹ and STEVE DIAL,² St. John's University¹ and Pfeiffer College²--Some ecological observations of the stinking cedar, *Torreya taxifolia* Arn.

Populations of *Torreya taxifolia* Arn., one of the rarest of Florida's trees, were observed on limestone bluffs on the eastern banks of the Apalachicola River and its tributaries. It occurs naturally in three counties in Florida: Gadsden, Liberty and Jackson, and at one station in southern Decatur County, Georgia. *Torreya* is an evergreen, small tree with whorled branches. Its twigs are stiff and green. The leaves are lustrous, green, stiff, and pungent. Its common name, stinking cedar, is derived from the disagreeable odor given off when the tree or its bark, branches, or leaves are bruised. Information on its discovery, native range, climate, soils and topography, associated forest cover, life history, reaction to competition and special uses of the species will be discussed. It is estimated that no more than 100 *Torreya*s 1.5 to 2.0 meters tall are living today. A fungal disease is responsible for *Torreya*'s demise. Extinction is the probable fate of *Torreya*.

STALTER, RICHARD; WILLIAM NIETER, MICHAEL LOCASCIO, STANLEY BULANOWSKI. --Environmental Studies Program, St. John's University, Jamaica, New York-- A forty-five year history of the arborescent vegetation of Alley Pond Park, Queens County, New York.

The arborescent vegetation of Alley Pond Park, Queens County, New York was sampled by the quadrat method in July 1981. Field data was compared to a detailed topographic tree survey map prepared by the Works Program Administration in 1936. Three diverse sites in the oldest section of the park were selected for study. Red Oak maintained itself as the dominant canopy tree species in two of the sites. Red Oak was dominant at the third site in 1936 but has been replaced by black oak in 1981. Total basal area was higher in 1981 than in 1936 at each of the sites. Additional vegetational changes will be discussed.

STEFFENS, JOHN C., OAVIO G. LYNN, AND J.L. RIOPEL. University of Virginia--Molecular specificity of haustoria induction in *Agalinis purpurea*.

Host recognition by the angiosperm root parasite *Agalinis purpurea* (Scrophulariaceae) occurs through the development of the haustorium, which forms a physiological and morphological bridge between parasite and host. Our studies with *Agalinis* show that initiation of the haustorium is regulated by exogenous substances contained in host root exudate. We have isolated two structurally similar flavonoid molecules which show potent activity in haustorial initiation. These compounds have been synthesized along with a number of structural analogs which have allowed us to explore the molecular specificity and structural requirements of haustorial initiation.

STONE, BENJAMIN P. Austin Peay State University--Bacitracin Reversal of CA & IAA Enhanced Plant Growth Responses.

The effect of Bacitracin upon oat coleoptile, pea epicotyl, and lettuce seedling elongation was investigated. Bacitracin reversed CA & IAA enhanced growth responses in these tissues. Glycoprotein synthesis in relation to hormone enhanced growth responses will be discussed.

STRINGFELLOW, FRANK AND FRANK W. DOUVRES. U.S. Department of Agriculture, Science and Education, Agricultural Research Service, Animal Parasitology Institute--Factors influencing development of *Haemonchus contortus* to young adults in vitro.

Roller culture systems have been devised in

which Haemonchus contortus, the large stomach worm of sheep, can develop from exsheathed infective larvae up to young adults. The culture systems consisted of complex-cell-free medium API-1 (Douvres and Malakatis, 1977) when used alone or supplemented with a bovine heme compound (Filde's reagent or hemin) or cholesterol, with gas phases that included 5-10% CO₂, and 5-10% O₂, and 85% N₂ at pH 6.4 to 6.8 in roller bottles. Based on culture periods of up to 37 days, the best development of H. contortus larvae to young adult males and females was obtained in a system consisting of medium API-1 supplemented with Filde's reagent which contained a hemin concentration of 96 µg/ml, with a gas phase of 85% N₂/5% O₂/10% CO₂, at 6.4 for the first 7 days and at pH 6.8 thereafter. Beginning with an inoculum of 40,000 H. contortus/40 ml medium this system produced maximal yields of 100% early fourth to late fourth stage by days 14-21, 4% at fourth molt and less than 1% young adults by day 28. The largest young adult male and female measured 7 mm and 8 mm long, respectively.

STRITCH, LAWRENCE R. Southern Illinois University--A Floristic Survey of the Hayes Creek Canyon Watershed, Pope County, Illinois.

A systematic survey of the vascular flora of the Hayes Creek Canyon watershed resulted in the recording of 735 taxa, 48 county records, and 6 state records. Nine Illinois endangered species were found, along with one Illinois threatened species. The richness and diversity of the flora resulted in reports being filed with the U.S. Forest Service and the Illinois State Nature Preserves Commission for future management considerations.

STUCKY, JON M. and ROBERT L. BECKMANN. North Carolina State University--Pollination biology, self-incompatibility, and sterility in Ipomoea pandurata (L.) G. F. W. Meyer (Convolvulaceae).

Ipomoea pandurata rarely produces seed. Sporophytic self-incompatibility is a secondary factor contributing to the reduced seed production because the principal pollinators, Bombus pennsylvanicus (Apidae) and Melitoma taurea (Anthophoridae), effect cross-pollination in most populations. Sterility, expressed as pollen tube failure in the style and as a sterility mechanism in the ovary, is the primary factor accounting for reduced seed production. It is difficult to reconcile the extensive geographical distribution of I. pandurata with this sterility.

SUTTER, ROBERT D. Plant Conservation Program, North Carolina Department of Agriculture--Is Venus Fly Trap (Dionaea muscipula) an endangered species?
Venus Fly Trap (Dionaea muscipula) is endemic to the coastal plain of North and South Carolina, is collected and widely sold,

and is of concern to several federal and state agencies concerning its potentially threatened nature. In 1980 the Department of Interior proposed to list the species on Appendix II of the Convention of International Trade in Endangered Species. The Fish and Wildlife Service lists the species as having probable appropriateness of listing as Endangered or Threatened, but for which sufficient information is not presently available to biologically support a proposed rule. In order to assess the effect of collection and the threatened nature of the species the Plant Conservation Program in the North Carolina Department of Agriculture initiated several studies. Data will be presented on the distribution, the collection pressures, and ecology of Venus Fly Trap. The studies have shown that collection has had little effect on the species.

SUTTER, ROBERT D. Plant Conservation Program, North Carolina Department of Agriculture--Collection pressure, population structure, and the survival of Ginseng (Panax quinquefolium) in North Carolina.

Current regulations of the U. S. Fish and Wildlife Permit Office require states desiring to export Ginseng (Panax quinquefolium) to maintain a monitoring program to assess the status of the species in the state. The goal of the program is to ascertain if collection of Ginseng is detrimental to the continued existence of the species. The Plant Conservation Program in the North Carolina Department of Agriculture has been monitoring ginseng populations. Data will be presented from three years of monitoring including data on fecundity, seed set, and collection pressures. Several population projection matrices will be discussed and the results used to predict the survival and vigor of native populations.

TAPATABAI, REBECCA N. Memphis State University--Effect of X-rays on the daily variation of mouse blood cells.

Forty-eight male mice were bled each week for eight weeks to study daily variation in blood cells. A significant (P less than .001) daily variation was found in total white blood cells, with the minimum occurring at 8PM and the maximum occurring during the daylight hours between 8AM and 2PM. Fifteen mice from the original 48 were then exposed to 100R x-radiation and were bled along with 16 controls at either 2AM, 11AM, 2PM, or 11PM once a week for five weeks. A significant (P less than .05) decrease in total white blood cells of the exposed mice occurred at 2AM and 11AM on days 7 and 14. A significant (P less than .05) decrease was seen only at 2AM on days 21 and 28. By day 35, no significant decrease was observed.

TEARE, CATHERINE, The University of Alabama--Fitness of *Drosophila melanogaster*.

Several life history parameters were measured in the vestigial-winged strain of *Drosophila melanogaster* to determine the effects of random temperatures in coarse and fine-grained environments on the overall population fitness. A greater reproductive capacity, decreased generation time, and increased overall population fitness were noted with increasing temperatures.

THOMAS, RICHARD B.¹, J. DANIEL PITILLO,¹ and GARRETT A. SMATHERS², Western Carolina University and ²National Park Service--Invasion of *Fagus grandifolia* into a high elevation heath bald at Craggy Gardens, NC.

High elevation heath bald communities containing *Rhododendron catawbiense* have sometimes been considered to represent stable climax communities, possibly inhibiting hardwood invasion by allelopathic interference. Observations at Craggy Gardens, however, suggest that this high elevation heath community is receding with birch, *Betula alleghanensis*, encroaching on the Northern slope and beech, *Fagus grandifolia*, invading on the southern slope. Recently, analysis of vegetation has shown that beech trees are indeed encroaching on the heath community. Aging of trees along a transect running southeast from the *Rhododendron* community also implies the invasion of *Fagus*. Further observations have indicated that this invasion of beech is occurring by means of root sprouting. As the beech roots move into the *Rhododendron* community, the *rhododendron* degenerates in the contact zone, opening the area to the young developing beech sprouts.

THOMPSON, RALPH L. Berea College--Floristic analysis of the Lily surface-mine experimental area, Lily, Kentucky.

The Lily surface-mine, an 14.5-hectare acid shale stripmine in Laurel County, Kentucky, was abandoned and the spoils graded in 1965. One hundred-ten indigenous or nonindigenous woody and herbaceous species were planted in selected plots by the Northeastern Forest Experiment Station personnel in 1965-1966 to identify promising erosion control and wildlife habitat plants on acid mine spoils. The Lily surface-mine area has been allowed to progress through natural plant succession since these plantings over 17 years ago. The Lily site provided an excellent opportunity for a floristic study of the natural plant components and the survival of the introduced species. Thirty 2 m x 100 m belt transects were utilized to determine forest structure, and sixty 1 m x 1 m square quadrats were used for species composition of herbaceous members. The dominant overstory species is *Pinus virginiana* and other important trees include *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Robinia pseudoacacia*, *Cornus florida*, and *Betula nigra*. Important shrubs and vines are *Rhus copallina*, *R. glabra*, *R. radicans*, *Rubus* sp., *Rosa multiflora*, and *Smilax glauca*. The herb layer is dominated by members of the Poaceae, Asteraceae, and Fabaceae. An annotated list

is comprised of 335 taxa from 85 families. Sixty-eight introduced species are persisting from the original experimental plantings.

TIMMONS, TOM J. Auburn University--Resource partitioning between largemouth bass, *Micropterus salmoides*, and yellow perch, *Perca flavescens*, young of the year at West Point Lake, Alabama-Georgia.

Yellow perch, *Perca flavescens*, and largemouth bass, *Micropterus salmoides*, young of the year appear to be segregated both spatially and by food choice throughout their first year. Yellow perch spawned in March, and fry first schooled in deep limnetic water, as suggested by their absence in littoral collections. Largemouth bass spawned in April and May, and fry were abundant in weedy littoral areas. Yellow perch were larger than largemouth bass until late summer. They shared a common diet except yellow perch consumed larger invertebrates. Largemouth bass later consumed small fishes and soon caught up to yellow perch in length. Yellow perch continued to consume invertebrates. Examination of diet overlap by the Schoener index suggested little or no food overlap. High water temperatures in summer may spatially segregate yellow perch from largemouth bass and prey fishes.

TOLBERT, VIRGINIA R.¹ and ERIN E. BREWER.² Oak Ridge National Laboratory¹ and University of the South²--A comparison of responses of growth rates of creek chubs from undisturbed and surface-mining-disturbed streams to differences in food ration size.

This study examines the effects of three different quantities of food [trout chow (caloric content within 3% of that of an equal weight of benthos)] on the growth rates of creek chubs from a mining-stressed and an undisturbed stream. Young-of-the-year fish from each stream were assigned randomly (by stream) into twelve laboratory flow-through tanks (five fish/tank). All tanks were maintained at 20°C. Fish in two tanks from each stream received 0.05 g of food daily, which was determined to be the minimal amount necessary to maintain body weight. This food level was determined to be comparable to the weight of benthos available to fish in the disturbed stream. Two tanks of fish from each stream received 0.15 g daily, which was comparable to the weight of benthos available to fish from the undisturbed stream, and the remaining two tanks of fish from each stream received 0.45 g of food daily. The (0.45 g) food level was used to determine if the growth rate of chubs from both streams would be greater at a more abundant food level. Those fish receiving 0.45 g food grew at a rate between that of the other two groups. Data analysis showed that growth during the experiment was linear and that, at all feeding levels, fish from the mining-disturbed stream grew significantly more than those from the undisturbed stream. The results of our study showed that growth rates cannot be predicted based solely on food studies and that factors affecting growth rates appear to be interrelated. The implications of these results will be discussed. ¹Operated by Union Carbide Corp. under contract Na. W-7405-eng-26 for the U.S. Dept. of Energy.

TOLMAN, DIANNE C. University of North Carolina at Charlotte--Ranunculus subcordatus: Species Biology of an Endangered North Carolina Endemic.

Ranunculus subcordatus was described as a new species by E.O. Beal in 1971 from two locations in the Coastal Plain of North Carolina. Beal considered it to be native, but mentioned the possibility of its relationship to the South American species, Ranunculus bonariensis. Because of its limited distribution, R. subcordatus is listed as an endangered endemic. Clarification of its taxonomic identity will have implications for its protection status. Field work has uncovered new populations. Seeds have been collected and plants have been grown to flowering in the same season as the seeds were produced. The chromosome number has been determined. The most recent discovery is an unusual form of vegetative reproduction.

TRAVIS, JOSEPH. Florida State University--Comparative demography of populations of *Amianthium muscaetoxicum*.

The perennial lily, *Amianthium muscaetoxicum*, occurs in numerous populations at the Mountain Lake Biological Station in Virginia. There is no asexual production of spatially distinct individuals; a genetic individual can be defined and measured, and its pattern of reproductive investment can be quantified. As a prelude to an experimental test of life history theory, data were collected on the natural history, comparative size structure, and comparative fertility of closely adjacent populations. Pollination is accomplished through a variety of insect vectors, whose abundance and diversity vary with habitat. Wind-borne pollen may also play a role in fertilization. The sizes of reproductive structures are directly related to plant size, but this relationship varies among different populations. The spatial pattern of plants in a population is one of aggregation, and closely adjacent populations display different patterns of size structure. Fertility varies within and among populations, and levels of fertility appear to be correlated with habitat. Although fertility is not correlated with plant size, larger plants produce smaller seeds. The extensive phenotypic variation among populations provides a strong basis for an experimental investigation of comparative population dynamics and comparative life histories.

TRAVIS, JOSEPH. Florida State University--Size at metamorphosis in amphibians: test of a model based on intraspecific competition.

Within cohorts of larval amphibians, individual size at metamorphosis often displays a positive relationship to length of larval period. One model for this relationship predicts that all individuals will transform at a common size if growth is not food limited. When growth is food limited, the model predicts the positive relationship if competitive release produces increased per capita food levels for the more slowly developing larvae as the more rapid developers transform. This model was tested by raising 160

individual *Hyla gratiosa* larvae under two food levels (high and low) and two schemes of food allocation. In the incremented scheme, total food levels remained constant but per capita levels were incremented with each metamorphic event to simulate continual competitive release. In the constant food scheme, per capita levels were unchanged. Tadpoles grew more slowly at low food levels. At high food levels, under both allocation schemes, size at metamorphosis was independent of length of larval period. At low food levels under the constant scheme, a similar result was obtained, although the average size was decreased. At low food levels under the incremented scheme, size at metamorphosis increased with increasing length of larval period. Lower food levels increased the duration of larval life, but allocation scheme had no effect. These results support a threshold size model for the timing of metamorphosis, and the intraspecific competition model for the size at metamorphosis.

TUSKAN, GERALD A. and ARMANDO A. DE LA CRUZ. Mississippi State University--Solar input and energy storage in a five-year-old American sycamore plantation.

Energy stored in a five-year-old American sycamore (*Platanus occidentalis* L.) plantation grown in Mississippi was determined by bomb calorimetry of component parts of selected trees randomly sampled in autumn and spring. The results indicated significant differences among tree components. The caloric values were 4675.81 cal g⁻¹ for leaves, 4631.76 cal g⁻¹ for branch bark, 4489.12 cal g⁻¹ for branch wood, 4753.85 cal g⁻¹ for stem bark, and 4488.76 cal g⁻¹ for stem wood. Based on these caloric values, the total energy yield for a one ha plantation, containing 1200 trees with a total above-ground biomass of 20.3 metric tons, was computed at 9.22 x 10¹⁰ calories. The storage efficiency of the forest stand, which was calculated by dividing total energy yields by available photosynthetic solar radiation received during the growing season (168,472 x 10⁸ cal), was 0.55%. The biomass yield of this five-year-old sycamore plantation is sufficient to supply the electrical energy needs of an average household for nearly three years.

TYLER, WILLIAM A. and ROBERT L. SHIPP. University of South Alabama--Population estimates of commercial fishes using mark/recapture and visual census from the Florida Middle Grounds.

Population estimates of commercially important fishes from an isolated reef area in the Florida Middle Grounds were obtained from mark and recapture of tagged fishes and point count and transect censuses using a submersible. Of 555 individuals tagged representing 38 species, 22 tags were recovered from individuals of seven species. *Haemulon plumieri*, *Pagrus pagrus* and *Epinephelus morio* exhibited the highest proportion of recaptures:

27.3, 20.0 and 17.6 percent, respectively. Approximately 15 tagged fishes were recorded during the visual censuses and are incorporated into the population estimates. Breakaway tagged bottom longlines as a method for tagging and estimating reef fish populations proved of lesser value, due to rapid bait removal by smaller, non-commercial species.

UGLEM, GARY L., and JOHN P. HARLEY.
University of Kentucky and Eastern
Kentucky University--Allosteric transport
of uracil by Hymenolepis diminuta.

The transport mechanism for pyrimidines in *Hymenolepis diminuta* is more complex than many of its other transport systems which display Michaelis-Menten kinetics. For example, a plot of ^{14}C -uracil uptake vs. concentration (0.1-10.0 mM) is sigmoid-shaped (Mac-Innis and Ridley, 1969, J. Parasitol. 55: 1134-1140); they postulated that increased binding of uracil to an "activator" site increases the rate of translocation of uracil via the "transport" site. Our experiments designed to test this hypothesis suggested the presence of two transport sites (1 and 2) in addition to an activator site. Transport site 2, which is allosterically regulated, could be "primed" by preincubating the worms for 15 min with 10 mM unlabelled thymine. Subsequent ^{14}C -uracil uptake was not sigmoid, but displayed typical Michaelis kinetics with an apparent V_{max} and K_t of 20 $\mu\text{moles/g dry wt/hr}$ and 0.5 mM, respectively. Under these conditions the relative amount of uracil transported through site 2 was 30%. Hypoxanthine (10 mM) completely inhibited site 1, but had little effect on site 2. The priming effect required a 1 min preincubation with 10 mM thymine. This effect was reversible by washing in saline, but required at least a 15 min wash indicating that the activator site is located inside the worm. Allosteric transport activity was highest in the anterior segment of the worm and decreased progressively in the middle and posterior segments. Uracil uptake by cysticercoids occurred by diffusion alone. Thus, the development of the activator-transport complex for pyrimidines occurs after ingestion of the larvae by the vertebrate host.

(Supported by NSF grant PCM78-16088)

UPTON, STEVE J.,¹ and DONALD W. DUSZYNSKI.² Auburn University¹ and University of New Mexico².--Development of Eimeria funduli in Fundulus heteroclitus.

Laboratory reared *Fundulus grandis* and *F. heteroclitus* were experimentally infected with *Eimeria funduli* by being fed *Palaemonetes pugio* (grass shrimp) collected from endemic areas. Histological studies of liver, hepatopancreas, spleen, gall bladder, kidney, intestine, peri-intestinal fat, reproductive organs, and brain from fish sacrificed at 1, 2, 6, 12, 18, and 24 hrs and 2, 5, 10, 15, 20, 25, 30, 35, 40, & 45 days after consuming naturally infected shrimp

showed a single schizogenous generation first seen five days after the infective meal. No developmental stages were positively identified in the tissues of experimentally infected fish prior to day five. Mature schizonts were found 10 days post-infection and contained 13-26 (16) merozoites. Gamonts appeared on day 15 and fertilization occurred between 15 and 20 days. After sporoblast formation, sporopodia appeared during sporocyst wall formation, about day 25. Sporozoite formation was completed by day 45 in most sporozoites.

VANGILDER, LARRY D., RICHARD T. HOPPE, and ROBERT A. KENNAMER. Savannah River Ecology Laboratory--A bio-telemetry study of the behavior and thermal biology of the American alligator.

A bio-telemetry study of the American alligator (*Alligator mississippiensis*) was undertaken in the Steel Creek drainage system near Aiken, SC. During the fall of 1981, alligators were outfitted with temperature sensing radio-collars and stomach temperature transmitters which registered environmental and core body temperatures. Results indicate that individual alligators can vary significantly in the relationship between their core body temperatures and environmental temperatures. For example, an adult male alligator showed core body temperatures consistently higher than environmental temperature and made frequent long distance movements (>100 m) in a cypress-tupelo swamp. At the same time, however, an adult female alligator had core temperatures consistently lower than environmental temperature and made infrequent movements within the confines of a small lagoon.

VARNEY, D.¹, M. SIEGEL², W. NESMITH², L. BUSH² and M. JOHNSON². Eastern Kentucky University¹, and University of Kentucky². Aspects of Chemical Control of the Endophyte, Epichloe typhina, in Fescue.

The presence of the endophyte *E. typhina* and associated high levels of alkaloids have been implicated in fescue toxicosis (summer syndrome) of cattle. Systemic fungicides (thiabendazole, benomyl, imazalil, thiophenate methyl, CCA 64251 and triadimefon) were tested for their ability to eradicate *E. typhina* from infested seed and to reduce development of the fungus in field-grown plants. Infected seeds were soaked in organic carriers containing the technical grade fungicides while the formulated products were applied to freshly cut infected fescue sward in the field. The field study was designed to find a treatment that would be fungistatic, thereby reducing the levels of the plant alkaloids. The presence of the fungus was determined by ELISA and the fescue alkaloids by GLC. None of the treatments eradicated the endophyte from 8 week old seedlings. *E. typhina* was present in 43% of the plants from the non-treated seeds and 7-50% of the plants from seed treated with the various fungicides. In the field study, neither alkaloid content nor detectable levels of the endophyte were affected by fungicide treatment.

VITT, LAURIE J. and RAYMOND D. SEMLITSCH.
Savannah River Ecology Laboratory--Environmental assessment; Significance of long-term ecological studies.

Long-term ecological studies of reptiles and amphibians in wetland habitats in the SE US demonstrate that community structure varies monthly and yearly and breeding success of certain species varies yearly. These results suggest that spot-sample species inventories in SE wetlands are of little value for environmental assessment. A long-term perturbation experiment compared reproductive success of amphibians between an undisturbed (control) and disturbed (experimental) Carolina bay. Even though breeding migrations of adults, oviposition and larvae production remained unaffected by perturbation, larvae in the experimental bay failed to metamorphose. Thus a critical stage in the life history of these amphibians was affected and this effect would not have been detected with standard spot inventory studies. A more sophisticated approach to environmental assessment should include long-term monitoring of populations and detailed life history studies such that natural sources of variation can be separated from variation caused by man.

VREDEVELD, GENE and PATRICIA PERFETTI. University of Tennessee at Chattanooga--Pollution effects on *Pinus virginiana* as determined by growth rings.

Pinus virginiana at the Volunteer Army Ammunition Plant near Chattanooga was exposed to elevated levels of NO_x and SO_2 pollution during the years 1967 - 1969. Cores were taken from trees located near the point source and at one half and one mile distance. The cores were processed to produce 2mm thick strips. These were exposed to radiation from Fe^{55} decay through a narrow window. The radiation penetrated the wood in proportion to its density, was collected by a scintillator counter which was connected to a graph and printout recorder. This information was processed by a computer program constructed to detect ring size and density differences as reflected depressed growth..

Warner, David A. and James Fralish. Southern Illinois University at Carbondale--A study of mid-canopy species in upland forest communities in the Ozark Plateau of Illinois.

Mid-canopy tree and shrub species biomass and distribution were studied in relation to site characters in 30 undisturbed upland stands in the Illinois Ozark Plateau. Across a range of site types, size and density data were collected for eleven species from nested quadrats of .0004 and .0016 ha. Stem biomass was estimated from allometric equations and used to calculate species and total biomass (kg/ha) in each stand. Species distribution and biomass patterns were

examined as a function of soil and other site factors. Patterns were most closely related to soil available water capacity, slope position, and aspect. *Vaccinium arboreum*, *Vaccinium vacillans*, and *Rhododendron roseum* reached their highest biomass level on xeric sites while *Asimina triloba*, *Lindera benzoin* and *Carpinus caroliniana* had high biomass levels on moist sites. *Ostrya virginiana*, *Amelanchier arborea* and *Cornus florida* exhibited peak biomass on intermediate sites. Total stand biomass was greatest on moist sites and lowest on intermediate sites.

WARREN, MELVIN L., JR. Kentucky Nature Preserves Commission--Observations on the effects of alkaline mine drainage on small-stream ichthyofauna in eastern Kentucky.

Research addressing the biotic and physicochemical effects of mine drainage on aquatic systems has generally focused on primary pollutants such as acid and siltation with little emphasis on the influence of alkaline mine drainage. The purpose of this research was to assess the effects of alkaline mine drainage on water quality and small-stream ichthyofauna in Colliers Creek, a second-order tributary of the Poor Fork of the Cumberland River, eastern Kentucky. Several physicochemical parameters and numbers of individuals and species were determined quarterly for three treatment levels (n=36): Station A--unimpacted, Mean $\text{HCO}_3 = 43$ mg/l; Station B--impacted, Mean $\text{HCO}_3 = 354$ mg/l; Station C--impacted, Mean $\text{HCO}_3 = 339$ mg/l. ANOVA indicated significant differences ($P=0.05$) in total number of individuals (Means: $X_A = 15.5$, $X_B = 33.9$, $X_C = 27.0$) and species (Means: $X_A = 2.08$, $X_B = 2.58$, $X_C = 2.75$). Differences among seasons were not significant. Community structure differed between the unimpacted and impacted stations. The ichthyofauna of Station A was dominated by a *Rhinichthys atratulus*-*Semotilus atromaculatus* community and Stations B and C harbored a *Rhinichthys atratulus*-*Etheostoma caeruleum* community. Based on these findings, preliminary analysis of macroinvertebrate densities ($X_A = 15$ ind./0.1 sq m n=5, $X_B = 85$ ind./0.1 sq m n=3), and observations of algal community structure and productivity, it is postulated that alkaline mine drainage has artificially increased biotic production above that observed in unimpacted segments of Colliers Creek. Analysis of periphyton and macrobenthos communities will further elucidate the impact of alkaline mine drainage on this small-stream ecosystem.

WEBER, MICHAEL R. North Carolina State University--The Taxonomy of *Saxifraga careyana* and *Saxifraga caroliniana*.

Saxifraga careyana and *Saxifraga caroliniana* are both considered "Special Concern Species" in North Carolina primarily on the basis of their questionable taxonomic status, and insufficient data as a basis for listing as Endangered or Threatened. The purpose of this investigation was to make a realistic taxonomic interpretation of the *S. careyana*-*S. caroliniana* complex. The methods employed included: (1) karyotypic analysis; (2) floral morphology; (3) vegetative

anatomy; (4) reproductive strategies; and (5) flavonoid chemistry. The results of this investigation justify two distinct species based upon floral morphology, flavonol compounds, and geographical distribution. Supported in part by a Grant-in-Aid from The Highlands Biological Station and the Plant Conservation Program, North Carolina Department of Agriculture, Pesticide and Plant Protection Division.

WERNER, WILLIAM E. and RONALD V. DIMOCK, JR.
Wake Forest University--Discrimination of potential molluscan hosts by the symbiotic water mite *Unionicola formosa*.

The water mite *Unionicola formosa* parasitizes the unionid mussel *Anodonta imbecilis*. The frequency of occurrence of *U. formosa* in *A. imbecilis* is essentially 100% in the study area. *U. formosa* also infrequently inhabits the sympatric congener *A. cataraeta*. Behavioral experiments with adult and nymphal *U. formosa* demonstrate specificity in the mite's aggregational response to potential host mussels. However, the larvae are probably the primary dispersal stage in the mite's life-cycle and analysis of larval chemotaxis with respect to excised host tissue indicates that they do not exhibit the specificity of aggregation behavior characteristic of nymphs and adults. Thus, the host specificity of *U. formosa* as evidenced by field data probably is not a direct consequence of specific host recognition by invasive larval mites. The behavioral specificity of nymphal and adult mites may result from some kind of conditioning process following the establishment of an association with a mussel.

WERTH, CHARLES R. Miami University--Genetic uniformity in *Calax*.

Populations of *Calax urceolata* were sampled from an east to west transect across North Carolina. A study of allozyme variation is in progress. Current data indicate little variation either within or between populations. Tetraploids appear to be neither more heterozygous than, nor genetically differentiated from, their diploid counterparts. These data are consistent with the presumed autopolyploid origin of the tetraploid cytotype.

WEST, JERRY L. and STEVE CRINDSTAFF,
western Carolina University--Lack of movement of brown trout (*Salmo trutta*) in a Western North Carolina trout stream.

To determine movement patterns of brown trout, a stream was divided into 100m sections. Brown trout were individually marked. Electrofishing samples were conducted in the summer (June and July), just prior to spawning (Oct.), immediately after spawning (Dec.) and in the early spring (March). Of 448 recaptures, 81.9% were within the section in which they were marked, and 13.5% either one section above or below. Thus 95.4% of the recaptures were within 200m of capture. Of 81 recaptures not in the section of capture, 68% were upstream and 32% downstream. Three recaptures were 600m upstream and 1 recapture

was 400m downstream. The data indicate that brown trout in this stream remain at their home stations and move very little. There was no spawning migrations.

WESTMORELAND, GAIL R. Southern Illinois University--Flora of the Union County Conservation Area, Illinois.

The purpose of this study was to compile the most complete list possible of the vascular flora within the refuge. Plant vouchers were collected and the plant habitats and communities were described. Also, a record was kept of all known vertebrate fauna encountered. The refuge is in a floodplain which lies in the lower Mississippi River Bottomlands Division. It is completely a wetland area except for a small section of mesic woods which was very productive. The soil types are mainly silty clay and silt loam. Approximately 480-500 species have been collected and about forty-five are county records. Some of the rare plants found are *Ammannia auriculata* Willd., *Anagallis arvensis* L., *Aristolochia serpentaria* var. *hastata* (Nutt.) Duchartre, *Ptilimnium costatum* (Ell.) Raf., and *Stachys palustris* var. *pilosa* (Nutt.) Fern.

WESTMORELAND, GAIL R. Southern Illinois University--The Genus *Hydrophyllum* in Illinois.

This taxonomic study was performed to better clarify and distinguish the species of *Hydrophyllum* in Illinois. The literature review produced little previous work on the genus in Illinois or surrounding states. The genus in Illinois is composed of the four eastern species--*H. appendiculatum* Michx., *H. canadense* L., *H. macrophyllum* Nutt., and *H. virginianum* L. Herbarium specimens (938) were obtained from eight herbaria throughout the state and were carefully studied. The resulting text included a dichotomous key and descriptions of the genus and each species including their habitats and occurrence in the state. This study revealed three important facts that should be known when working with this genus: 1) the biennial habit of *H. appendiculatum* produces variable leaves, 2) the pedicel and peduncle pubescence of *H. virginianum* and *H. macrophyllum* can easily distinguish them when the number of lobes of the compound leaves does not, and 3) the often confused species *H. virginianum* and another member of the family *Phacelia bipinnatifida* Michx. can be separated by the glandular-pubescent characterizing this species of *Phacelia*.

WHITE, PETER S. and GEORGE S. RAMSEUR.
Great Smoky Mountains National Park, and University of the South--Island biogeography of the Southern Appalachian high peaks.

Ten areas in the Southern Appalachians surpass 5500 ft (1718 m). These can be viewed as high elevation islands and island chains. Using data updated from the original work of George Ramseur, diversity patterns

of the high peaks were examined in light of MacArthur and Wilson's island paradigm. There is a positive correlation of species richness and island size ($r = .80$, $p < .01$); The slope of the relationship on a log/log plot is .21, a similar value to oceanic islands. The two smallest areas, Mount Pisgah and Whitetop, are much richer in species than would be expected based on their size alone. With these two islands excluded, the slope value is .27. Rare plant richness is also correlated with island size. However, far northern rare species are rather patchily distributed and are not correlated with island size. Pleistocene changes in plant distributions and post-Pleistocene climatic change have probably resulted in these present day patterns.

WHITLOCK, SUZANNE A.,¹ WILLIAM L. CURRENT,¹ and JOHN V. ERNST.² Auburn University¹ and USDA-AR.² The life cycle of *Eimeria roperi* in the cotton rat, *Sigmodon hispidus*.

Endogenous stages of *E. roperi* were studied in experimentally infected cotton rats, *Sigmodon hispidus*. Parasites were located in the cecum and colon deep within the epithelial cells of the crypts of Lieberkühn. The endogenous stages consisted of three generations of schizony followed by gametogony. Each schizogonous stage could be distinguished by the time of appearance, size and shape of the schizont, and number, size, shape, and arrangement of merozoites. Sporozoites were observed days one through three postinoculation (PI) and were designated as types I, II, and III on the basis of number and size of the posterior refractile bodies. Gamonts appeared on day six PI and mature macrogametes and microgametocytes by day eight PI. *Eimeria roperi* oocysts were collected directly from the intestinal tract of experimentally infected cotton rats. Oocysts were allowed to sporulate at various temperatures, examined at different time intervals, and classified as to stage of development. The mean percentage of oocysts at each stage of sporulation during incubation at the various temperatures was tabulated. Sporulation of *E. roperi* oocysts occurred when incubated at 20, 25, and 30°C and the thermal death point was 37°C.

WHITMAN, PAMELA A. and JOSEPH A. MARSHALL. West Virginia University--Tonic immobility in juvenile sandbar sharks, *Carcharhinus plumbeus* (Nardo).

Tonic immobility (or death-feigning) is considered to be a terminal anti-predator strategy in which an animal prevents an attack from continuing by remaining motionless. The phenomenon of tonic immobility was investigated in 17 female and 9 male sandbar sharks, *Carcharhinus plumbeus* (Nardo). Young sharks (50cm-90cm TL) were captured by rod and reel or long-line and tested for tonic immobility in a live-well aboard the fishing boat. Following a 15-min recovery period, immobility was induced by grasping the sharks by the posterior margin of the first dorsal fin and the caudal peduncle and inverting the

animal. After a brief struggle against this restraint, the body tone of the animal relaxed (the "limp" response). The limp response was used as the criterion for onset of tonic immobility since upon release the sharks remained motionless. Of the 26 sharks tested, three males (11.5%) did not exhibit tonic immobility during ten 90-sec induction trials. The mean induction time for the 23 sandbar sharks exhibiting tonic immobility was 39.5 sec (s.d.=15.6; range=20 sec - 83 sec). The duration of tonic immobility ranged from 8 sec to 591 sec ($\bar{x}$ =78.4 sec; s.d.=124.96).

WHITON, JOHN C. and JAMES D. LAWREY. George Mason University--Possible allelopathic effects of lichen secondary compounds.

Germination responses of *Sordaria fimicola* and *Cladonia cristatella* ascospores were observed in the presence of three pure lichen acids on buffered media ranging in pH from 4 to 7. Acetone solutions of either vulpinic (VUL), evernic (EVE) or stictic (STC) acid were poured onto buffered agar at a concentration of 2.7×10^{-3} M and the acetone allowed to evaporate. Ascospores were deposited on the agar surface and the percent spore germination was recorded after 24 hr. Comparisons were made with control plates to which only acetone was added. *Cladonia cristatella* inhibitory effects were observed in the presence of VUL, but not in the presence of EVE or STC. *Sordaria fimicola* spores were severely inhibited by both VUL and EVE, but not STC. No pH effects on lichen compound toxicity were observed, but *C. cristatella* spores exhibited little germination at pH 7. Lichen acids appear to be capable of functioning as allelopathic agents in nature; however, lichenized fungi may be better able to tolerate the inhibitory effects of lichen acids than non-lichenized fungi.

WICKELHAUS, TERI L. Western Kentucky University--The effects of photoperiod-temperature interactions on testicular regression and fattening in the green anole, *Anolis carolinensis*.

Two interrupted night experiments were carried out in anoles in July and August of 1981 in order to explore the possibility that temperature effects testicular regression and fattening responses to different photoperiodic treatments. The rate of testicular regression was increased in anoles held in environmental chambers set at 30°C compared with the rate of testicular regression in anoles held at 20°C under all photoperiodic regimes. In addition, testicular responsiveness to nightly light pulse treatments appeared to be dependent on the time of night light was introduced and temperature altered the effect of these treatments on testicular regression. Fat stores in anoles acclimated at 30°C in LD 10:14 were consistently greater compared with fat stores in anoles held at 20°C in LD 10:14, regardless of photoperiodic treatments. This project was funded by the Graduate Student Research Committee of Western Kentucky University.

WINSTEAD, JOE E. Western Kentucky University--Differential ion uptake in populations of *Andropogon virginicus* L. as an adaptative mechanism for survival on strip mine spoils.

Ecotypes of *Andropogon virginicus* to coal spoils have been demonstrated in previous work. Since strip mine spoil banks are potentially toxic in metal ions growth chamber studies were initiated to study differences in nutrient uptake between spoil adapted populations and populations from non-mined old field sites. Analysis of plant tissues from strip mine populations and old field populations grown in reciprocal soil tests revealed less accumulation of ions as Na, K, and Li in the populations adapted to coal spoils and increases of those elements in plants from old field sites when grown on strip mine soils. Reductions in metallic ion uptake may be keyed to slower growth rates providing survival in the harsh microclimate of strip mined habitats.

WISE, DWAYNE A. Mississippi State University--Meiosis in spermatocytes of lycosid spiders.

Males of most spider species have the sex chromosome constitution, X_1X_2 or $X_1X_2X_3$. At the first division of meiosis, these multiple, nonhomologous X chromosomes are passed to the same spindle pole and, thus, are carried in the same gamete. This nonrandom nondisjunction is necessary for the maintenance of the proper sex ratio in the population (females are $X_1X_1X_2X_2$ or $X_1X_1X_2X_2X_3X_3$). We have investigated the mechanism whereby this controlled nondisjunction of physically unconnected chromosomes occurs. Evidence from the light and electron microscopes indicates that the two sex chromosomes lie close together at meiotic prophase, but are not joined by a synaptonemal complex. We present other evi-

dence which suggests that the nondisjunction of the X's is accomplished by the presence of a complex system of membrane tubes which enclose the chromosomes at prometaphase and metaphase.

YEHL, TIMOTHY C. and ERIC I. MORGAN. Tennessee Technological University--Toxicity of scrubber sludge, ash sludge, and effluent from settling ponds at a coal-fired power plant to simplified microcosm consisting of *Daphnia pulex*, *Hexagenia munda*, and *Lirceus fontinalis*. Six-day chronic effects of scrubber sludge, ash sludge, and effluent from the settling ponds at a coal-fired power plant were evaluated in the laboratory under flow through, recirculating, and static conditions. Kaolin was employed as a control sediment. Mortality values for *L. fontinalis* subjected to ash and scrubber sludge treatments maintained under flow through conditions resulted in 54 and 70% losses while *H. munda* revealed higher losses of 86 and 96%, respectively. Recirculating effluent scrubber sludge mortality values for *L. fontinalis* and *H. munda* were 59 and 82%. Control mortality values were generally within acceptable limits. *H. munda* emergence values for flow through ash and scrubber sludge treatments were 2 and 0%. *Daphnia pulex* mortality values and average length for static effluent treatments of both sludges were 0% and 1.9mm. Average length of control daphids at the terminating of tests was 1.8mm. These chronic data support the observation that sludge was responsible for the elimination of *Hexagenia* and *Lirceus* in the effluent stream. The type of sludge, limestone scrubber or coal fly ash, appeared to have little effect on the degree of mortality. The effluent had no effect on *Daphnia* mortality and little or no effect on the growth rate over the 6-day toxicity test.

AUTHOR INDEX FOR PAPER NUMBER OR SYMPOSIUM

- Abraham, B. J.—35
 Anderson, B. D.—10
 Anderson, W.—Ecol. Gen. Symp.
 Angus, R. A.—75
 Ash, A. N.—174, 175
 Ashley, T.—113
 Austin, W. L.—106
- Bailey, H.—Ecol. Symp.
 Bailey, W. S.—133
 Baird, W. V.—108
 Barbour, R.—Ecol. Symp.
 Barr, T. C.—Ecol. Symp.
 Bartalon, J. G.—91
 Baskin, C. C.—184
 Baskin, J. M.—184
 Beckmann, R. L.—147
 Bell, C. R.—195
 Bellis, V. J.—171
 Benson, K. B.—54
 Benz, G. W.—135
 Boebinger, A.—28
 Bogitsh, B. J.—19, 20, 21
 Bonner, W. P.—45
 Boom, B. M.—26
 Bortone, S. A.—166
 Bowers, F. D.—188
 Boyd, J. W.—61
 Branson, B.—Ecol. Symp.
 Brennan, M.—183
 Brewer, E. E.—99
 Brown, L. P.—90, 91
 Brown, R. D.—37
 Brown, R. K.—10
 Bryant, W. S.—Ecol. Symp.
 Bulanowski, S.—182
 Bush, L.—125
- Cairns, J., Jr.—104
 Camburn, K. E.—44
 Cantrell, B.—168, 169
 Carter, R.—173, 192
 Chang, C. B.—138
 Chapman, M. G.—156
 Check, D. A.—63
 Chinnici, J. P.—94
 Clark, J. D.—123
 Coffey, J. C.—193
 Coffie, N.—60
 Coile, N. C.—51
 Comeaux, B. L.—203
 Cooper, C. M.—46, 100
 Cowden, R. R.—57
 Crawford, E. C.—65
- Cridlebaugh, P. A.—142
 Crossley, D. A., Jr.—96
 Current, W. L.—132, 133, 134, 135, 136
- Davenport, L. J.—154
 Davidson, J. L.—143
 De La Cruz, A. A.—27, 47
 Delcourt, H. R.—140, 141
 Delcourt, P. A.—140, 141
 Del Portillo, H. A.—120
 Demski, L. S.—70
 DeSelm, H. R.—Ecol. Symp., 180
 Devereux, J. G.—97
 Dial, S.—146
 Dickinson, P.—69
 Dimock, R. V., Jr.—117, 118, 119, 120
 Dodd, C. K., Jr.—11
 Dolin, P. S.—42
 Dorsett, D. R.—9
 Douvres, F. W.—22
 Driscoll, C.—121
 Duffield, L. F.—Ecol. Symp.
 Dunn, D. C.—118
 Dupre, R. K.—65
 Duszynski, D. W.—131
- Edwards, D. F.—5
 Edwards, R. W.—85, 139
 Ernst, J. V.—132, 133, 135, 136
 Esch, G. W.—18
 Estes, R. D.—45
 Etges, D. J.—21
 Evans, D. K.—194
- Farmer, J. M.—195
 Ferrell, B. R.—38
 Finstrom, M. F.—161
 Foster, L. A.—19
 Fralish, J.—Ecol. Symp., 183, 189
 Frazer, N. B.—163
 Frederick, L.—124
- Garippa, D.—59
 Giammara, B. L.—59, 88
 Gibbons, J. W.—158, 159, 162
 Gilbert, C. R.—166
 Gist, C. S.—96
 Gladden, J. B.—172, 187
 Granath, W. O., Jr.—18
 Grant, W. C.—59, 88
 Greene, J. L.—158
 Grigarick, A. A.—116
 Grindstaff, S.—73, 74
 Guttman, S.—149

- Hackney, C. T.—41
 Haney, D.—Ecol. Symp.
 Harker, J. S.—59, 88
 Hannan, R. R.—176
 Hardin, J. W.—50
 Harley, J. P.—16, 17, 138
 Harris, J. B.—64
 Harrison, F. W.—57
 Heins, D. C.—8, 9
 Henshaw, N. G.—137
 Hess, S. D.—68
 Holmes, L. H., Jr.—40
 Hoppe, R. T.—77
 Hornby, P. J.—70
 Howard, J. H.—97

 Ingersoll, G.—7
 Ireland, P. H.—12

 Jacobs, B. F.—149
 James, F.—Ecol. Gen. Symp.
 Jandebeur, T. S.—156, 157
 Jenkins, R. E.—166
 Jetton, T. L.—122
 Johnson, M.—125
 Johnson, M. F.—152
 Johnson, S. S.—84
 Johnston, G. F.—78
 Jones, B. E.—3
 Jones, L. M.—14
 Jones, R.—80
 Jones, R. L.—190
 Jones, S. B., Jr.—51
 Just, J. J.—63, 65

 Kalmus, G. W.—58, 61
 Kennamer, R. A.—77
 Kennedy, M. L.—92
 Kimbrough, T. D.—3, 4, 5, 6, 7
 Kivic, P. A.—112
 Kleiner, K. W.—172
 Krissinger, W. A.—82

 Lawrey, J. D.—129
 Learn, J.—10
 Leblanc, C.—102
 Lembke, H.—2
 Leung, T.-S.—102
 Lindquist, D. G.—14
 Lindsay, D. S.—136
 Lisle, J. T.—105
 Llewellyn, G. C.—2
 Locascio, M.—182
 Lohrman, T.—4
 Lynn, D. G.—107
 Lyons, E. T.—86

 MacGregor, J.—160
 MacLeish, N. F. F.—52

 Major, V.—83
 Mamaril, A. C.—47
 Mardon, D. N.—105
 Marion, K. R.—165
 Marshall, J. A.—155
 Matthews, J. F.—200
 Matthews, W. J.—164
 McCaffrey, C. A.—172, 187
 McCauley, D. E.—93
 McDonald, C. B.—174, 175
 McLeod, K. W.—177
 Mellichamp, T. L.—199, 200
 Miller, G. C.—88, 89, 130
 Mills, R. R.—2, 3, 4, 5, 6
 Mitchell, S. L.—79
 Mobley, R.—89
 Moran, G. B.—158
 Morgan, E. L.—101
 Mori, S. A.—26
 Morsches, S.—90
 Mulligan, T. J.—71
 Murphy, G. A.—36
 Murray, J.—Ecol. Gen. Symp.

 Nagy, F.—69
 Naqvi, S. M.—102
 Nelson, D. R.—116
 Nesmith, W.—125
 Neson, G. L.—56
 Newsome, A. L.—23
 Niemeier, S. E.—109
 Nieter, W.—182
 Nugen, C.—114

 O'Bara, C. J.—45
 Ogle, D. W.—25
 Oglesby, J. L.—166
 O'Kelley, J. C.—126
 Oskins, W. S.—191

 Palmer, J. M.—115
 Parr, P. D.—24
 Patrick, T. S.—198
 Patterson, K. K.—159
 Patton, C. S.—83
 Patton, S.—83, 84, 87
 Pennington, S. N.—58, 61
 Perfetti, P.—31
 Perry, J. D.—151
 Perschbacher, P. W.—72
 Petersen, R. L.—106, 128
 Petranksa, J. W.—34
 Phifer, C. X.—66
 Phillippi, A.—28
 Phillips, A.—128
 Phillips, D. L.—111, 144
 Pilatowski, R. E.—55
 Pittillo, J. D.—170, 181
 Pratt, J. R.—104

Prior, D. J.—66, 67, 68

Quarterman, E.—Ecol. Symp.

Rafii-Tabatabai, F.—92

Ramseur, G. S.—145, 178

Rayner, D. A.—202

Reese, N. C.—133, 134

Renzaglia, K. S.—127

Reynolds, J. D.—94

Richard, D. I.—103

Rigby, F. P.—124

Riopel, J. L.—107, 108

Risley, L. S.—96

Ritchie, J. C.—100

Robertson, P. A.—185

Rooks, J. R.—8

Ross, S. T.—164

Rufty, L.—117

Sadowski, T. S.—196

Sanders, C. B.—46

Saunders, P. R.—145

Schmalzer, P. A.—180

Schuster, R. O.—116

Schwartz, F. J.—15, 72

Scott, T. C.—127

Seed, J. R.—139

Semlitsch, R. D.—76

Sharitz, R. R.—172, 187

Shealy, H. E., Jr.—150

Shelton, P. A.—98

Shipp, R. L.—80, 81

Shute, J. R.—14

Shute, P. W.—14

Siegel, M.—125

Sievert, G.—160

Simpson, L. B.—167

Small, J. W., Jr.—103

Smathers, G. A.—145, 170, 181

Smith, M.—Ecol. Gen. Symp.

Snelson, F. F., Jr.—71

Solomon, J. A.—179

Stalter, R.—146, 182

Steffens, J. C.—107

Stone, B. P.—110

Stringfellow, F.—22

Stritch, L. R.—53

Stucky, J. M.—147

Sutter, R. D.—29, 30

Tabatabai, R. N.—1

Tarter, D. C.—42, 114

Taylor, F. G., Jr.—24

Teare, C.—62

Thomas, R. B.—170

Thompson, M. P.—138

Thompson, R. L.—153

Thorne, W. G.—106

Timmons, T. J.—13

Tolbert, V. R.—99

Tolman, D. C.—201

Travis, J.—33, 186

Tuskan, G. A.—27

Tyler, W. A.—81

Uglen, G. L.—17

Upton, S. J.—131

Vangilder, L. D.—77

Varney, D.—125

Vitt, L. J.—76

Vredeveld, G.—31

Walne, P. L.—112

Warner, D. A.—189

Warren, M. L., Jr.—43, 44

Weatherly, N. F.—88

Webb, T., III—141

Weber, M. R.—197

Werner, W. E.—119

Werth, C. R.—148, 149

West, J. L.—73, 74

Westmoreland, G. R.—48, 49

White, P. S.—178

Whitlock, S. A.—132

Whitman, P. A.—155

Whiton, J. C.—129

Whittaker, F. H.—59

Wickelhaus, T. L.—39

Wilhelm, W. E.—23

Williams, A. L.—60

Wilson, R. W.—58

Winstead, J. E.—32

Wise, D. A.—95

Yehl, T. C.—101

Young, R. A.—109

ASB Candidates for Office—1982

The Nominating Committee, composed of Delores S. Dundee, Burton J. Bogitsh, and Chairman James W. Hardin, has selected the following slate of nominees for the ASB offices to be filled this year. Additional nominations will be received from the floor. Voting will take place at the Annual Business Meeting, Friday morning, April 16.

President-Elect:—**Charles E. Jenner**, University of North Carolina, Chapel Hill

—**Frank J. Schwartz**, University of North Carolina Institute of Marine Science

Vice-President:—**Jon R. Fortman**, Mississippi University for Women

—**J. Kenneth Shull, Jr.**, Loyola University

Secretary:—**Janice C. Coffey**, St. Mary's College

—**Rebecca R. Sharitz**, Savannah River Ecology Laboratory

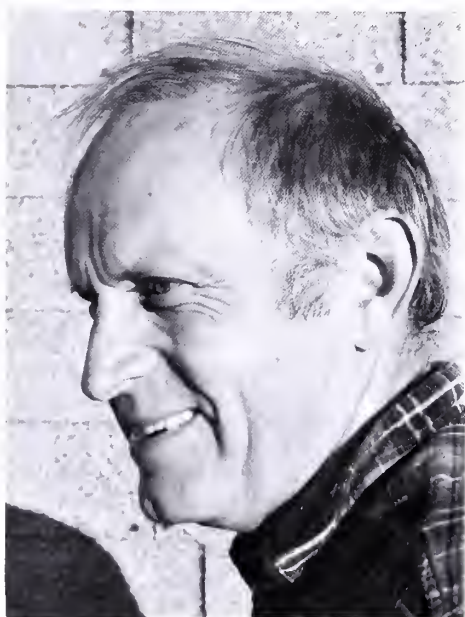
Executive Comm.:—**Russell L. Chapman**, Louisiana State University

(two positions) —**William C. Grant**, North Carolina State University

—**David G. Lindquist**, University of North Carolina, Wilmington

—**Paul Yokley, Jr.**, University of North Alabama

PRESIDENT-ELECT



Charles E. Jenner



Frank J. Schwartz

Charles E. Jenner—Dr. Jenner received the A.B. (1941) degree from Central College (Fayette, Missouri) and the M.A. (1949) and Ph.D. (1951) degrees from Harvard University. He has been on the faculty of the Department of Zoology at the **University of North Carolina at Chapel Hill** since 1950, serving as Chairman from 1957 to 1962. He also taught the Marine Ecology course at the Marine Biological Laboratory at Woods Hole from 1952 to 1956 and taught the Invertebrate Zoology course there in 1961. Dr. Jenner is a member of the American Society of Limnology and Oceanography, the Atlantic Estuarine Research Society, the American Society of Zoologists, the Western Society of Naturalists, the Marine Biological Laboratory Corporation, and other professional organizations. He has belonged to ASB since 1952 and has served two 3-year terms on the Research Award Committee. He currently is on the Board of Trustees of the Highlands Biological Foundation, the Board of Advisors of Carrying Capacity, Advisory Board of the Meadowcreek Project (Fox, Arkansas), and the Board of Directors of the North Carolina Academy of Science. He is Chairman of the Academy's Public Affairs and Policy Committee and recently was appointed to organize an Academy program promoting more inter-disciplinary courses in North Carolina colleges and universities about the related problems of population, resources, and environment. He has served on the State of North Carolina's Natural History Museum Endangered Species Committee and on the Chapel Hill citizen task force assessing the effect of the Shearon Harris Nuclear Plant on the city. Dr. Jenner's research interest is in the biology of marine and freshwater invertebrates, with particular interest in environmental control of seasonal biological events (photoperiodism), Odonata, commensal bivalve molluscs, the marine snail *Ilyanassa obsoleta*, the protobranch bivalve *Solemya velum*, and the marine mudshrimp *Upogebia*.

Frank J. Schwartz—Presently Professor of Marine Sciences and Curator of Fishes at the **University of North Carolina, Institute of Marine Sciences**, Dr. Schwartz received his B.S., M.S., and Ph.D. degrees at the University of Pittsburgh. He held teaching and research positions at West Virginia University, Creighton University, and University of Maryland's Chesapeake Biological Laboratory prior to joining the Institute in 1967. Dr. Schwartz has conducted research and traveled worldwide on grants from Smithsonian Institution (carangids), U.S.-USSR (joint oceanic explorations), American Museum of Natural History (faunal surveys), National Science Foundation (studies in South America), and Office of Naval Research (deep sea investigations). Nearly 200 papers have been authored or coauthored on marine and freshwater fishes, sea turtles, jellyfishes, crayfishes, and other groups. His current research involves marine and freshwater fishes, especially sharks, rare and endangered species, fish hybrids, and sea turtles. Dr. Schwartz has advised 4 Ph.D. and 17 M.S. degree students. He was editor of Transactions of the American Fisheries Society 1966-68, Copeia 1968-73, and associate editor of Chesapeake Science 1964-75. He was elected Fellow of Ohio Academy of Sciences, Member of the Board Bermuda Biological Station, and Board of Governors of the American Society of Ichthyologists and Herpetologists. He is a member of 16 national and international professional societies, chairman of the American Fisheries Society's Endangered Species Committee, serves on North Carolina's Endangered Species Committee, and is consultant to a number of power companies on environmental problems. Dr. Schwartz joined ASB in 1975 and has chaired several ASB sessions in ecology, ichthyology, and herpetology.

VICE-PRESIDENT

Jon R. Fortman—Dr. Fortman is Professor of Biology at **Mississippi University for Women**, where he has taught since 1968. He began his teaching career in 1959 at Maynard Evans High School, Orlando, Florida. He was the recipient of the National Association of Biology Teachers Outstanding Biology Teacher Award of Florida in 1966. Through the years, he has taught elementary school, Jr.-Sr. High, and at the Jr. College and University levels. He was a member of Valencia Community College faculty in Orlando, and an adjunct professor at Florida State University before coming to MUW. He received his B.S. degree from the University of Florida, a M.Ed. and M.A. from Louisiana State University and Southern Methodist University, respectively, and his Ph.D. from Mississippi State University. Research interests and publications are in the area of larval amphibian development and behavior. Dr. Fortman has been a member of ASB since 1969. He was elected to the Executive Committee from 1977-80, and has served as *ASB Bulletin* News Editor since 1974. He also was elected in 1968-70 and 1978-80 to serve as a Regional Director of NABT, and on the Board of Directors. He presently is the Biological Science Curriculum Study Consultant for Mississippi. He

holds membership in the Association of Southeastern Biologists, National Association of Biology Teachers, Mississippi Association of Science, Phi Kappa Phi, and Beta Beta Beta.

J. Kenneth Shull, Jr.—A native of Anniston, Alabama, Dr. Shull earned a B.S. in Chemistry from the University of Alabama in 1963 and in 1967 he received an M.S. in Biology from the same institution. He earned a Ph.D. in Genetics from Florida State University in 1973 where he was a recipient of an NIH Genetics Traineeship as well as research and teaching assistantships. He has worked as an electron microscopist in parasitology and is currently an Associate Professor of Biology at Loyola University, New Orleans, where he has been on the faculty since 1973. Dr. Shull's research interests are in the area of chromosome homology, nuclear cytology during meiosis, and the cytotoxicity of the genus *Lilium*. He serves as the pre-dental adviser at Loyola, is on the faculty Development Committee, and is a member of the Loyola Speaker's Bureau. He serves on the Committee for Protection of Human Subjects at Xavier University and has participated in the Southeastern Seminar Circuit. As a member of ASB since 1970, Dr. Shull has chaired the 1978 Travel Awards Committee and the 1981 Research Awards Committee and was co-organizer of the 1981 ASB Genetics Symposium. He is the organizer of the 1982 ASB Symposium on Ecological Genetics to be held at the Eastern Kentucky meeting. Dr. Shull is also a member of the Genetics Society of America, the Genetics Society of Canada, AAAS, Sigma Xi, and the Lily Society of America.

SECRETARY

Janice C. Coffey—Dr. Coffey received her B.S. in Science Education from Appalachian State University and M.S. and Ph.D. degrees in Biology from the University of South Carolina. She has taught at Clemson University, Queens College, the University of South Carolina, North Carolina State University, and is currently Chairman of the Science Department at St. Mary's College, Raleigh, North Carolina. Her main interest is the teaching of botany and biology to undergraduate students. Her research interests in the systematics of the Juncaceae have led to field and herbarium studies in several parts of the world for work toward preparation of a monograph on this family. She has received grants from the National Science Foundation, the National Academy of Sciences, and the Fulbright Commission. A member of the ASB for nearly 20 years as student and teacher, she is also a member of the American Society for Plant Taxonomy, the International Association for Plant Taxonomy, the Botanical Society of America, AAAS, AIBS, Sigma Xi, Phi Beta Kappa, and the Southern Appalachian Botanical Club. She has served on the Council and as Secretary of the ASPT and as a member of various committees of the Botanical Society. She reviews Russian publications for the IAPT and produced the latest "Guide to Graduate Study in Botany for the USA and Canada" for the Botanical Society. A member of several conservation organizations, she is interested in the preservation of natural areas.

Rebecca R. Sharitz—Dr. Rebecca Sharitz is Associate Ecologist at the Savannah River Ecology Laboratory and Adjunct Associate Professor of Botany at the University of Georgia. She received her B.S. from Roanoke College and her Ph.D. from the University of North Carolina. Since joining the research faculty at SREL in 1972, she has published in the areas of plant population biology, thermal ecology, and effects of stress on wetlands species and communities. In 1975–76, she worked as a technical representative to the Energy Research and Development Administration and with the U.S. Secretariat of the Man and Biosphere Program. She has served on committees of the National Academy of Sciences, MAB, the National Science Foundation, and The Institute of Ecology. A member of several scientific societies, she has served the Ecological Society of America as an officer of the Southeastern Chapter (Vice-President 1976–78, President 1978–80), a Council member and a member of the Board of Professional Certification, as well as a member of various other committees. She is presently Secretary and Program Chairman of the Ecological Section of the Botanical Society of America and Newsletter Editor of the International Society of Plant Population Biologists.

EXECUTIVE COMMITTEE

Russell L. Chapman—Dr. Chapman received the A.B. degree (1968) from Dartmouth College and the M.S. (1970) and Ph.D. (1973) degrees from the University of California, Davis where he was a N.S.F. Graduate Fellow. He has been on the faculty of the Department of Botany at Louisiana State

University in Baton Rouge since 1973, and is currently an Associate Professor of Botany and Associate Dean of the College of Arts and Sciences. Dr. Chapman is a member of the Phycological Society of America (wherein he served as Chairman of the Bold Award Committee and as a member of the Nominating Committee), the British Phycological Society, the International Phycological Society, the Botanical Society of America (wherein he served as Secretary of the Phycological Section), the Electron Microscopy Society of America, the Louisiana Society for Electron Microscopy, Inc. (wherein he served as Treasurer, President-Elect, President, and Past-President), the Louisiana Academy of Science, and the Association of Southeastern Biologists. He is a member of Phi Kappa Phi and Sigma Xi (wherein he is currently Secretary of the LSU Chapter). Dr. Chapman has reviewed manuscripts for the American Journal of Botany, Annals of Botany, Journal of Phycology, Canadian Journal of Botany, and Transactions of the American Microscopical Society. Dr. Chapman was selected by the LSU System Distinguished Faculty Fellowship Committee for the Amoco Foundation, Inc. Outstanding Undergraduate Teaching Award (1978) and recently received the LSU Alumni Federation Distinguished Faculty Award in recognition of outstanding contributions to the University in teaching, research, and administration (1981). Dr. Chapman's phycological research actually began when, as a N.S.F. Undergraduate Research Participant, he worked at the Sapelo Island Marine Institute and completed a study of the macroscopic marine algae of Georgia. His research interests have involved the ultrastructure of algae in general and subaerial green algae (Chroolepidaceae) in particular. The research program has included studies of lichenized forms of the Chroolepidaceae (e.g. the lichen *Strigula*) as well as the host-parasite interaction between the alga *Cephaleuros* and hosts such as *Magnolia*.

William C. Grant—A native of Mullins, South Carolina, Dr. Grant is an Associate Professor in the Department of Zoology at North Carolina State University, Raleigh, North Carolina. Dr. Grant received the B.S. degree (1965) in Biology from Livingstone College, Salisbury, North Carolina, and the M.S. (1969) and Ph.D. (1972) degrees in Zoology from North Carolina State University. He was an Assistant Professor of Biology at State University of New York, College at Old Westbury during 1971–74. He has been on the faculty at North Carolina State University since 1974 and was promoted to the rank of Associate Professor in 1979. Dr. Grant was elected to the North Carolina State University Academy of Outstanding Teachers in 1981. He is a Visiting Scientist at the Dental Research Center, University of North Carolina at Chapel Hill. Dr. Grant's general research interest is the ultrastructure of parasites, particularly helminths. He has also studied the fine structure of mitochondrial DNA of trypanosomes. During a recent study leave (Fall, 1981) at the Dental Research Center, University of North Carolina at Chapel Hill, Dr. Grant used several light and electron microscope histochemical methods to study peroxidases in inflammation. Much of this work involved the use of schistosome egg granuloma as a model for the study of hypersensitivity. Dr. Grant is a member of the ASB, the Southeastern Society of Parasitologists, Southeast Electron Microscope Society, Helminthological Society of Washington, American Society of Parasitologists, and Alpha Epsilon Delta, the Premedical Honor Society.

David G. Lindquist—Dr. Lindquist is Associate Professor of Biology and Curator of Fishes at University of North Carolina at Wilmington. He received the B.A. (1968) from UCLA, the M.A. (1972) from California State University at Hayward, and completed his doctoral work at The University of Arizona in 1975. As a member of UNC-Wilmington's faculty since 1975, he has taught various subjects ranging from introductory biology and zoology to ichthyology and behavioral ecology of reef fishes. Dr. Lindquist is a member of the American Society of Ichthyologists and Herpetologists and is currently serving as Secretary-Treasurer for the southeastern section. He is also a member of the North Carolina Academy of Science, the Southeastern Fishes Council, and other professional organizations. He has been a member of ASB for five years. Dr. Lindquist has general research interests in the biology of marine and freshwater fishes, with particular interest in the behavior and ecology of reef fishes and the natural history of southeastern freshwater fishes. He is currently coediting a volume of papers for the series "Developments in Environmental Biology of Fishes" and is organizing a symposium on darter ecology and behavior for the 1982 ASIH meeting.

Paul Yokley, Jr.—Paul Yokley, Jr. is Professor of Biology at the University of North Alabama. He received the B.S. and M.A. degrees from George Peabody College, Nashville, Tennessee, and the Ph.D. degree at the Ohio State University, Columbus, Ohio. He is a member of Phi Kappa Phi and Beta Beta Beta and Southeastern Regional Vice-President of the latter. He is a member of the American Fisheries Society, American Malacological Union, the North American Benthological Society,

and a Fellow in the American Institute of Fishery Research Biologists. He is a long-standing member of ASB receiving the Research Award in 1969 and serving on the Research Awards Committee for three years. He received a National Science Foundation Fellowship in 1960-61 to further his studies. He was selected for the Alabama Conservation Educator Award in 1972 presented by the governor. His research and main interests are in taxonomy and life cycles of freshwater mussels and fish. Besides full time teaching at U.N.A., he is a consultant for T.V.A. Environmental Division and has worked several years in environmental and mollusk research for the Tennessee Wildlife Resources Agency, Alabama Soil Conservation Service, Mobile Corps of Engineers, and private industries. He is chairman of the graduate committee at U.N.A. and has directed the research of several of the graduate students. He is responsible for the arrangements and program of Beta Beta Beta which meets with ASB each year.

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE AND PLACES

Alabama

University of Alabama, Huntsville. The Biology Department has become the Biological Sciences Department. The new designation more accurately reflects the broad and indepth offerings in the basic and applied biological sciences. *Dr. P. S. Campbell* has been appointed Section Chairman for Biological Sciences for the Alabama Academy of Sciences. *Dr. H. J. Wilson* has returned from a one year sabbatical at the University of Illinois at Urbana. *Dr. Robert Lawton* has recently conducted studies into the ecology and population dynamics of cloud forest trees in the mountains of Costa Rica. *Dr. Richard Modlin* and *Ms. Pamela Modlin*, graduate student in development, recently attended meetings in England of the International Society of Invertebrate Reproduction.

Arkansas

Southern Arkansas University, Department of Biology. *Dr. Henry W. Robison* was recently honored by being named the 1981 Honor Professor for the University for "outstanding classroom teaching, academic excellence, and public service." The honor carries a \$500 award to be used for professional travel and/or research materials.

Florida

Florida State University, Department of Biological Sciences. *Dr. Christopher Lingle* will be joining the department in the Spring as an Assistant Professor. *Dr. Lingle*, whose specialty is physiology, is presently at Brandeis University.

University of Florida, Botany Department. *Dr. William Louis Stern* convened a meeting of Florida botanists at the John Young Science Center, Orlando. Those attending discussed a proposal for completing the flora of the State. It was agreed that *Dr. Donovan S. Correll* of the Fairchild Tropical Garden, and *Dr. Richard Wunderlin* of the University of South Florida would act as coordinators and major contributors to the project. *Dr. George Bowes* has been appointed to a statewide panel by the Florida Department of Natural Resources to draw up procedures to regulate the importation into Florida of exotic plants that might be potential pests. *Becky J. Brown*, a doctoral student, has been notified that her paper entitled "Productivity and herbivory in high and low diversity tropical successional ecosystems" had been selected from among the 54 submitted, as the best student paper presented at the 1981 Ecological Society of America meeting, and that she is the winner of the Murray F. Buell Award. *Dr. Dana G. Griffin III* will teach a graduate course in tropical bryology at the National University of Colombia, Bogota, Colombia. *Dr. James W. Kimbrough* participated in a symposium on Fungal/Insect Relationships, held at the Boyce Thompson Institute, Cornell University, October 1981. While at Cornell, he presented a colloquium lecture on "Septal structure and a reclassification of the Teliomycetes." *Dr. Indra K. Vasil* spent three weeks of the Fall semester in the People's Republic of China attending an international conference as a guest of Academia Sinica and the International Rice Research Institute. The conference was devoted to the discussion of cell and tissue culture methods in the improvement of cereal crops.

Georgia

Agnes Scott College, Department of Biology. *Dr. Harry Wistrand* has been awarded a William and Flora Hewlett Foundation Grant for support in investigating the role of epicuticular lipids in the adaptation of *Drosophila pseudoobscura* to its environment.

Kentucky

Murray State University, Department of Biological Sciences. An organizational meeting of the Ecological Consortium of Mid America, an organization of seven colleges and universities, was held at the Hancock Biological Station on November 13, 1981. The purpose of the consortium is to formalize, and thus strengthen, inter-institutional collaboration in research and education—with the field station, and the Land Between the Lakes as an operational focus. Charter member institutions include Kentucky Wesleyan, Bellarmine College, the University of Kentucky, St. Louis Community Colleges, Georgetown College, Oakland City College, and Murray State University. As many as six additional institutions are expected to affiliate within the next several months. Hancock Biological Station and the Land Between the Lakes will soon be designated as an experimental ecological reserve by the Institute of Ecology.

Louisiana

University of New Orleans, Department of Biological Sciences. Teaching assistants are being sought in the department due to continued growth. With over 16,000 students, the 28 member faculty handles over 300 biology majors and a Master's program. Positions for T.A.'s are usually open. In addition to space in the existing Science building, a new Life Sciences building is now available.

Louisiana State University, Botany Department. *Dr. Lowell E. Urbatsch* was appointed Assistant Dean of the Graduate School effective July 1, 1981. *Dr. David J. Longstreth* has received a three year grant to study the control of photosynthesis in developing leaves. *Dr. G. Michael W. Adams* has joined the College of Arts and Sciences, Division of Research Services, as a part-time computer consultant. *Dr. Meredith Blackwell* has been elected Councilor of the Mycological Society of America for a one year term. She attended a Symposium on Fungal-Insect Relationships: Perspectives in Ecology and Evolution at Syracuse and Cornell in October 1981.

University of Southwestern Louisiana, Department of Biology. *Dr. Steven Crain Hand* (Ph.D. Oregon State University) joined the faculty in January 1982, at the rank of Assistant Professor. Dr. Hand has been on a post-doctoral appointment at the Scripps Institute of Oceanography during the past two years.

Mississippi

Gulf Coast Research Laboratory, Ocean Springs. *C. E. Dawson* has returned from Sydney, Australia, where he presented a paper at the International Conference on Systematics and Evolution of Indo-Pacific Fishes. The title of the paper was "Review of the Indo-Pacific Pipefish genus *Doryrhamphus*." He also conducted research in museums in Australia, the Philippines, and the United States. The Laboratory will offer 16 courses during the summer of 1982. Term I will run from May 31 to July 9, with some courses beginning on June 14th. Term II will run from July 12 to August 20, with some courses ending August 6th and 13th. For further information contact: *Dr. David Cook*, GCRL, Ocean Springs, MS 39564. *Dr. Robin Overstreet* participated in a U.S.-USSR workshop on parasitology and pathology of marine animals, held at the Zoological Institute in Leningrad, Russia. *Dr. A. Venkatar-amiah*, *Dr. G. J. Lakshmi*, and *Christine Best*, presented a paper at the Fourth Water Chlorination Conference, held in Pacific Grove, California.

The University of Mississippi, Department of Biology. *Terry L. Mullen* (Ph.D. Oregon State University) has joined the department as an Assistant Professor. His research interest is in mechanisms of membrane transport processes and ions, and osmotic regulation in freshwater organisms.

The Crosby Arboretum Foundation, Hattiesburg. A regional arboretum representing plants and trees native to the Pearl River Basin will be developed in Picayune, Mississippi, as a memorial to one of the region's outstanding industrialists. The arboretum will be dedicated to the memory of L. O. Crosby, Jr., forest products industrialist, philanthropist, and former mayor of Picayune, who died in 1978. With an anticipated opening date in 1983, the 58-acre arboretum will contain named samples of all the woody and many of the herbaceous plants native to south central Mississippi, and neighboring Louisiana, and will include over 300 varieties of trees, shrubs, wildflowers, and grasses. It will also provide habitat and sanctuary for many species of wildlife.

North Carolina

University of North Carolina at Wilmington, Department of Biology. The department expanded into the newly constructed third floor of the Marine Science Building at the end of the summer 1981. Two

new faculty members joined the staff: *Dr. Richard Dillaman* (Ph.D. University of South Carolina), Assistant Professor, who will operate the new electron microscope installed at the Institute for Marine Biomedical Research, and *Dr. Ronald K. Sizemore* (Ph.D. University of Maryland) who replaced Mr. Frank Allen, who retired last year. Dr. Sizemore is a marine microbiologist. *Dr. Courtney T. Hackney* and *Dr. David E. Padgett* received a grant to evaluate the use of antibiotics to distinguish between fungal and bacterial respiration in decomposing salt marsh roots and rhizomes. *Dr. Robert Y. George* will be leaving for the Palmer Station in Antarctica in December 1981 to undertake a study concerning the effect of temperature and pressure on Antarctic krill. *Dr. Charles Fugler* left for Bolivia to continue his studies of tropical biology.

University of North Carolina at Charlotte, Department of Biology. Through the generosity of the Chimney Rock Corporation, the department now has a field station in the beautiful resort area of Chimney Rock and Lake Lure. The station has sleeping and dining facilities to accommodate 50 students, a laboratory for research, and a meeting room. It is located in the Hickory Nut Gorge, cut by the Broad River, which was a heavily used passage to the western mountains. *Dr. James F. Matthews*, who spear-headed the project, states that the area is one that has not been researched biologically to any great extent.

North Carolina State University, Department of Horticultural Science. *Dr. August De Hertogh* was elected a Fellow in the American Society of Horticultural Science in recognition of his outstanding research and expertise on bulb crops. *Clara Allen* was elected secretary, ASHS southern region, collegiate branch. *Dr. Thomas Monaco* was one of three authors receiving a Superior Award in the Communications Critique and Awards Program conducted by the Agricultural Communicators in Education, for their extension publication entitled "Identifying Seedling and Mature Weeds Common in the Southeastern United States." *Dr. Walter A. Skroch* was awarded the "Outstanding Extension Service Award" for 1981. After two years of operation, the North Carolina Agricultural Weather Program is well underway. An agricultural weather advisory is issued Monday through Friday over the NOAA Weather Wire from the Agricultural Weather Office on the campus of NCSU. The advisories contain up-to-date information about how forecast weather conditions will affect livestock and poultry operations, diseases, insects, land preparation, and planting and harvest conditions. The program is under the direction of *Dr. Katie Perry* and *Mr. Greg Johnson*.

North Carolina State University, Department of Zoology. *Dr. Don Hayne* received the Clarence W. Watson Award given by the Southern Division of the American Fisheries Society, S.E. Section of The Wildlife Society, and the S.E. Association of Fish and Wildlife Agencies. Dr. Hayne also received a service award. *Dr. John G. Vandenberg* will be installed as President of the Animal Behavior Society in June 1982.

Elon College, Department of Biology and Allied Health. *Dr. G. Lynwood Ryals, Jr.* has resigned as chairman to take a position with Biomedical Reference Laboratories. *Dr. Herbert W. House, Jr.* has been appointed chairman of the department. The department is now offering Bachelor of Science degrees in Cytotechnology and in the Medical Laboratory Technician program.

East Carolina University, Department of Biology. *Edward P. Ryan* chaired a session at the 1981 meeting of the International Society of Invertebrate Reproduction at the University of Newcastle-upon-Tyne, England, and presented a paper on ovulation cycles in two species of portunid crabs.

South Carolina

College of Charleston, Department of Biology. *Dr. Phillip Dustan* (Ph.D. State University of NY-Stony Brook) was appointed Assistant Professor of Biology. He was formerly Assistant Research Biologist, Visibility Laboratory, Scripps Institute of Oceanography.

Winthrop College, Department of Biology. Beginning in January 1982, Winthrop will offer the Master of Science degree in Biology, replacing the previous Master of Arts in Teaching degree. The M.S. degree has a thesis option; students who do not choose to write a thesis will instead be required to complete two research courses.

University of South Carolina, Department of Biology. Recent appointments are: *Dr. Franklin F. Bolander, Jr.* from the National Institute of Health, Bethesda, Maryland; *Dr. Robert J. Feller* and *Dr. James T. Morris* from Marine Biological Laboratory, Woods Hole, Massachusetts.

Tennessee

Middle Tennessee State University, Department of Biology. *Philip M. Mathis* has been named Editor of SCST Publications succeeding *Adrian W. Poitras* of Miami-Dade Community College. Mathis will

serve as editor for all SCST publications including its *Newsletter* and will work with President Druger, and members of the SCST Steering Committee, to develop the special "SCST Page" for the *Journal of College Science Teaching*. *Patrick J. Doyle* was named "Outstanding Teacher" by the MTSU Foundation. The award carries various forms of public recognition plus a \$1000 stipend. *Jesse Lane Fletcher* retired in May of 1981 after 20 years as a Professor of Biology. Before coming to MTSU, Dr. Fletcher worked as a research associate at Mississippi State University, Louisiana State University, University of Kentucky, and was a staff physiologist for the U.S. Department of Agriculture. He is presently teaching part-time at Cumberland College. *Mary de los Reyes* (Ph.D. Auburn University—microbiology) has joined the faculty. She is a native of Cuba who immigrated to the United States in 1960. Previous appointments have been Northwestern State University and Copiah-Lincoln Junior College. *Sarah H. Swain* (M.A.T. Vanderbilt University) joined the biology faculty as an Instructor of Biology. *Sarah Barlow* is a new member of the department on a tenure track position as Instructor of Biology.

University of Tennessee at Chattanooga, Department of Biology. *Dr. Charles H. Nelson* has been appointed Acting Head for the current academic year. *Dr. Gene S. Van Horn* has been promoted to the rank of Professor of Biology.

University of Tennessee at Knoxville, Botany Department. *Dr. A. J. Sharp* has been awarded honorary membership in the Botanical Society of Mexico on the occasion of its fortieth anniversary. The award was made during the eighth Mexican Congress of Botany in Morelia, Mexico during the third week of October 1981. The honorary membership was accompanied by a handpainted lithograph of the floral emblem of the Society. *Dr. Randolph R. Henke* has been appointed Associate Professor of Botany. His specialties are plant physiology and genetics. He is also the principal investigator of a \$1.1 million contract from Agrigenetics Research Corporation to look for new and more productive mutant strains of wheat and barley with higher nutritional value, and increased resistance to disease, environmental stress, and chemicals.

Virginia

Virginia Commonwealth University, Department of Biology. *Dr. Gerald C. Llewellyn* organized and participated in the Mycotoxin Symposium which was presented at the August meeting of the Society for Industrial Microbiology in Richmond. He recently presented a paper on mycotoxins in Aberdeen, Scotland. *Dr. Lewis C. Goldstein*, Professor of Biology, will retire on December 31, 1981.

University of Virginia, Mountain Lake Biological Station. Field biology Post-doctoral fellowships are available for summer research at the Biological Station. These awards, funded by the University of Virginia, are for the purpose of promoting field research by young investigators who have recently received their Ph.D. degree. Proposals will be considered for a wide variety of ecological and evolutionary studies. The stipend is \$1900, and the deadline for application is April 1, 1982. Write to: Director, Mountain Lake Biological Station, Gilmer Hall, University of Virginia, Charlottesville, VA 22901.

Christopher Newport College, Department of Biology. Bids were recently accepted for a new 20,800 ft² science facility to house the biology and chemistry departments. *Dr. T. Edward Weiss* has joined the department as an Instructor in Biology.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Washington, DC

Smithsonian Institution. J. L. Barnard's Handbook, "The Families and Genera of Marine Gammaridean Amphipoda," originally issued as U.S. National Museum Bulletin 271 in 1969, and out of print for some years, will be reprinted by the Smithsonian Institution under the auspices of the Waldo L. Schmitt Memorial Fund. Orders for this volume should include payment of \$15 in U.S. currency (checks or money orders only, please), and should be sent to: Barnard Reprint, NHB Stop 163, Smithsonian Institution, Washington, DC 20560 U.S.A.

North Carolina

North Carolina State Museum of Natural History. The museum will host the combined 25th Anniversary Meeting of the Society for the Study of Amphibians and Reptiles, the 30th Annual Meeting of the Herpetologists' League, during the period 1-6 August 1982. A special SSAR Silver Anniversary

Symposium, "Molecular and Genomic Evolution of Amphibians and Reptiles," organized and moderated by David B. Wake, University of California at Berkeley, will highlight the events. In addition, four workshops are currently planned: (1) "Program Funding, Administration and the Practicalities of Running a Regional Herpetological Society," (2) "Gopher Tortoise Council," (3) "Photography," and (4) "Funding Sources for Herpetological Research." For further details contact Ray E. Ashton, N.C. State Museum, Box 27647, Raleigh, NC 27611. Dr. John E. Cooper has recently completed a draft recovery plan for the Alabama cavefish, *Speoplatyrhinus poulsoni*. This rare species is endemic to a subterranean system in northwestern Alabama, and is recognized as Threatened in federal listings.

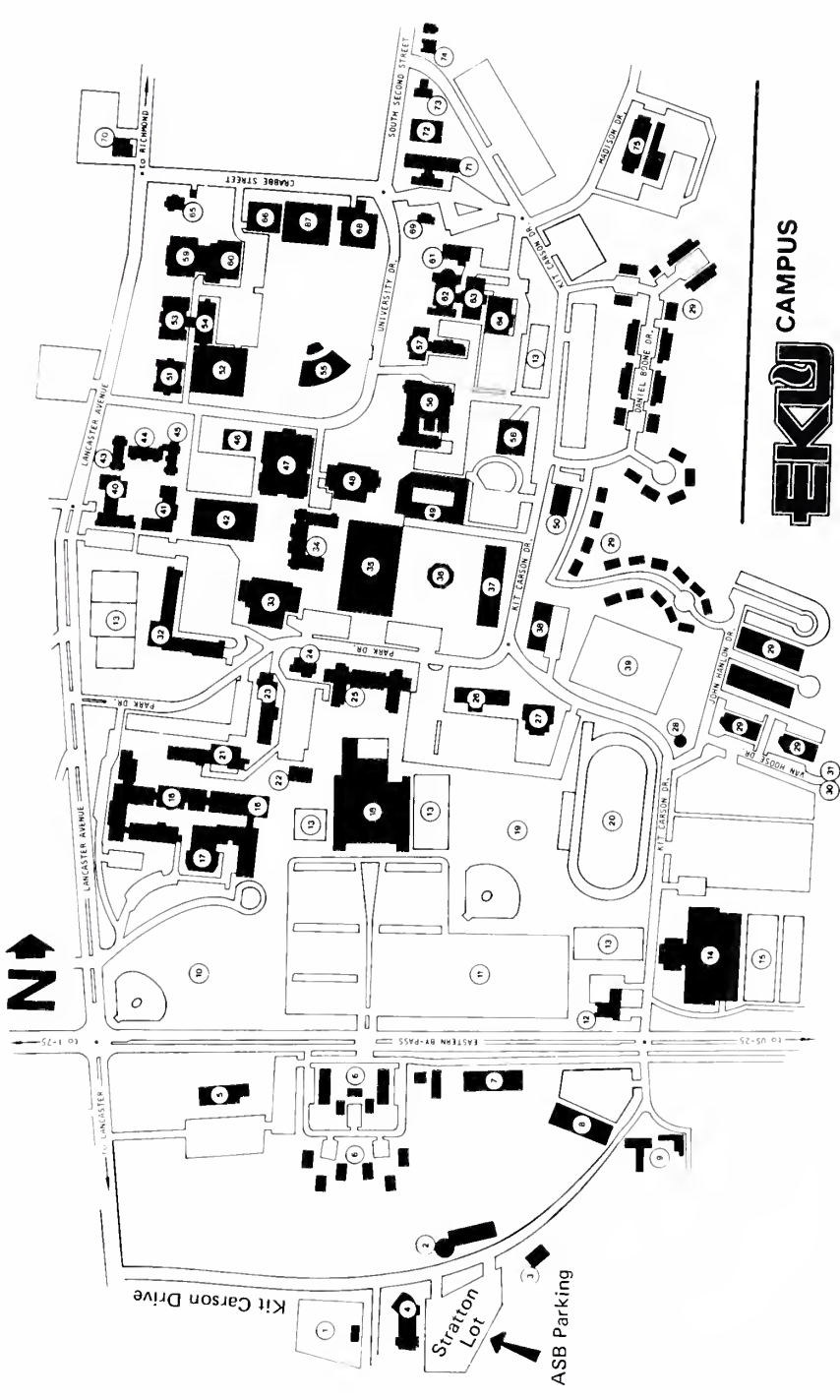
Florida

The Marie Selby Botanical Gardens, Sarasota. The Gardens has been chosen as the site of the First International Symposium on the Family Gesneriaceae to be held from July 5 to 7, 1982. Invitations to professional botanists and graduate students were mailed worldwide last July. The recipients are all scientists working in gesneriad research. Scientific papers will be presented the first two days of the meeting. On the third day, they will make an excursion to Corkscrew Swamp in the Florida Everglades. Members of the general public interested in sitting in on the symposium as silent listeners may write or phone Dr. Wiehler at 800 S. Palm Ave., Sarasota, Florida 33578; phone: (813) 366-5730. Harry E. Luther, director of the Bromeliad Identification Center at the Gardens, has been invited to address the 1982 World Bromeliad Conference and Show to be held this year from June 10-13 in Corpus Christi, Texas.

Fairchild Tropical Gardens, Miami. Roger W. Sanders has joined as an Assistant Taxonomist. Dr. Sanders is initiating systematic studies of the wild and cultivated species of *Lantana*.

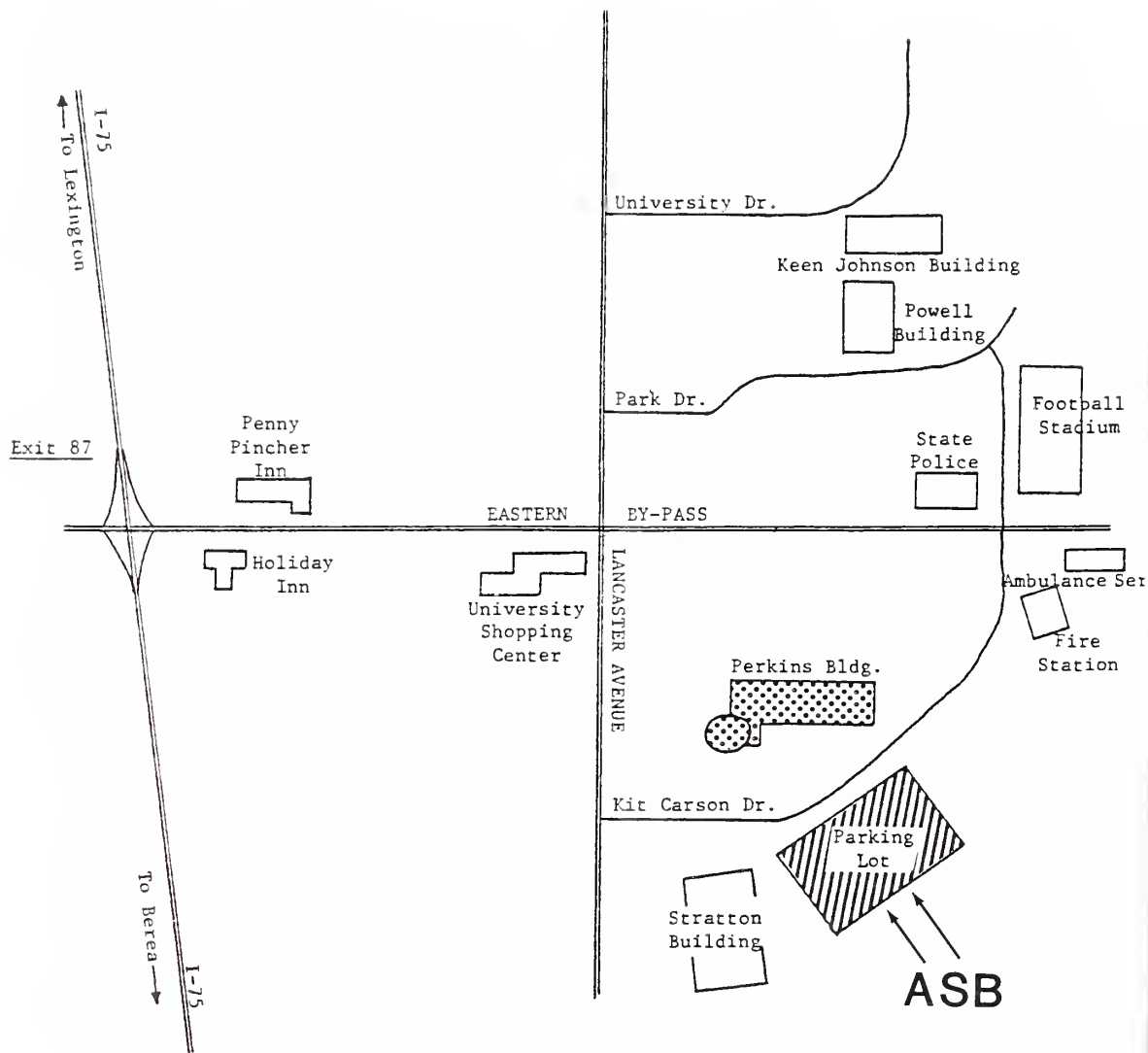
South Carolina

Brookgreen Gardens, Murrells Inlet. A reinforced educational program was initiated this fall to reach the schools in this area. Brookgreen Gardens' naturalist, Kathy King, and director, G. L. Tarbox, Jr. met with Horry and Georgetown County school officials, and presented ideas to more actively involve students in field trips, nature walks, and informal lectures. Several school groups have already taken advantage of this valuable resource. Since last spring, Brookgreen Gardens has been involved in a fund-raising drive to build an interpretive facility. So far nearly half of the total amount needed has been pledged by businesses, foundations, and individuals. It is hoped that ground may be broken by the summer of 1982. To aid local schools in the education process, a new book has been presented to high school, college, and public libraries in Horry and Georgetown Counties. Each library sent a representative to the ceremony held at the Gardens to accept the book: *A Century of American Sculpture: Treasures from Brookgreen Gardens*.



BUILDINGS OF INTEREST TO ASB

- | | |
|--|--|
| 2. Perkins Building -- Registration and Sessions | 35. Powell Building -- Student Center, Cafeteria |
| 4. Stratton Building -- General Session
Business Meeting
ASB/ESA Symposium | 48. Keen Johnson Building -- ASB Banquet |
| | 50. Brewer Building -- Campus Security |
| | 52. Moore Building -- Biology Department |



The ASB

QH301
.A78
*

59.06

BULLETIN

Volume 29, Number 3

July 1982



Telium of Fusiform Rust

***The Official Quarterly Publication of
The Association of Southeastern Biologists***

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

REBECCA R. SHARITZ
Associate Editor

JON FORIMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Past President — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

President Elect — Charles E. Jenner, Zoology, University of North Carolina, Chapel Hill, NC 27514

Vice-President — J. Kenneth Shull, Jr., Biology, Loyola University, New Orleans, LA 70118

Secretary — Rebecca R. Sharitz, Savannah River Ecology Laboratory, Aiken, SC 29801

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —

Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059

Sharon Patton (1984), Veterinary Pathobiology, University of Tennessee, Knoxville, TN 37916

William C. Grant (1985), Zoology, North Carolina State University, Raleigh, NC 27650

Paul Yokley, Jr. (1985), Biology, North Alabama University, Florence, AL 35630

AAAS Representative, Section G —

Lafayette Frederick, Botany, Howard University, Washington, DC 20059

CONTENTS

Energy Flow in a North Carolina Salt Marsh: A Synthesis of Experimental and Published Data. <i>L. M. Cammen, U. Blum, E. D. Seneca, and L. M. Stroud</i>	111
Quaternary Paleocology of the Southeastern United States. <i>P. A. and H. R. Delcourt</i>	135
At the Richmond Meeting	139
Association Affairs	144
News of Biology in the Southeast	149

COVER

A germinating telium of *Cronartium quercuum* f. sp. *fusiforme* (Basidiomycete) on the abaxial surface of a red oak leaf. This obligate parasite infects certain species of oaks and pines as alternate hosts. SEM, $\times 200$. Courtesy of Dr. Dennis J. Gray, Department of Botany, N.C. State University, Raleigh.

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Company, Greenville, SC

TIME AND PLACE OF FUTURE MEETINGS

1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984	April 11-14	Memphis State University
1985		Middle Tennessee State University, Murfreesboro
1987		University of Georgia, Athens (50th Anniversary)



Energy Flow in a North Carolina Salt Marsh: A Synthesis of Experimental and Published Data

*Leon M. Cammen**, *Udo Blum*,
Ernest D. Seneca, and *Linda M. Stroud*

*Department of Botany, North Carolina State University,
Raleigh, North Carolina 27650*

An energy budget was developed for the emergent portion of a *Spartina alterniflora* marsh located in the Cape Fear River Estuary, NC, based on data from this marsh and, where needed, values from the literature. Gross primary production was about 1.1% of incident solar energy; of this amount 31% was respired by the primary producers, mainly *Spartina* and benthic microalgae, leaving a net production of $7987 \text{ kcal m}^{-2} \text{ yr}^{-1}$. The equivalent of 50% of the net production ($3955 \text{ kcal m}^{-2} \text{ yr}^{-1}$) was respired by the microbes, but combined meiofaunal and macrofaunal respiration amounted to only 8% ($670 \text{ kcal m}^{-2} \text{ yr}^{-1}$). About 42% of the net production was available for export from the marsh to the estuary with about $\frac{1}{3}$ of that amount in the form of dissolved organic carbon and about $\frac{2}{3}$ in the form of particulate matter; a portion of the particulate matter was probably lost to the marsh sediment as accretion.

Previous marsh energy budgets have significantly overestimated *Spartina* respiration and thus underestimated both the efficiency of *Spartina* and the resulting net production. In addition, they have not considered directly release of DOC from live *Spartina*, decaying litter and sediment or methane release from the sediment surface; together these pathways accounted for 38% of the production remaining after microbial and faunal respiration.

INTRODUCTION

A band of salt marshes dominated by the cordgrass *Spartina alterniflora* extends along much of the East and Gulf Coasts of the United States. These marsh systems are important both as nursery grounds for many commercially important fish and shrimp species (Odum 1961; McHugh 1966; Newsom 1968; Day *et al.* 1973; Daiber 1974; Birkhead *et al.* 1977; Copeland and Hodson 1977; Pendleton 1979; Laney 1981) and as areas where excess nutrients are removed from the overlying water in a manner analogous to tertiary waste treatment (Gosselink *et al.* 1974; Valiela *et al.* 1975).

Although there have been several studies of energy flow through individual components of salt marshes, there have been only three comprehensive studies of emergent marsh systems. Energy flow has been studied for populations of the fiddler crabs *Uca pugnax* (Shanholtzer 1973; Krebs 1976; Cammen *et al.* 1980) and *U. minax* (Cammen *et al.* 1980), the marsh periwinkle *Littorina irrorata* (Odum and Smalley 1959; Alexander 1976; Shirley *et al.* 1978; Cammen *et al.* 1980), the mussel *Geukensia demissa* (= *Modiolus demissus*) (Kuenzler 1961), and the grasshopper *Orchelimum fidicinium* (Smalley 1960). Energy flow through the entire emergent marsh system has been studied only in Georgia (Teal 1962).

* Present address: Bigelow Laboratory for Ocean Sciences, McKown Point, West Boothbay Harbor, Maine 04575.

Louisiana (Day *et al.* 1973), and Massachusetts (Howarth and Teal 1980); the investigation of a Rhode Island salt marsh by Nixon and Oviatt (1973) emphasized the embayment, not the emergent marsh.

There is some disagreement in the literature as to the role of the emergent marsh in supplying nutrients to the surrounding waters and the degree to which the biota in those waters depend on these nutrients. The three marsh budgets (Teal 1962; Day *et al.* 1973; Howarth and Teal 1980) suggested that about 45% to 56% of net aboveground primary production was available for export in salt marsh ecosystems. Measurements of material transport in tidal creeks indicate that some marshes export detritus (Odum and de la Cruz 1967; Schultz and Quinn 1973; Boon 1974; Settlemyre and Gardner 1975; Axelrad *et al.* 1976; Valiela *et al.* 1978), some import detritus (Hackney 1977; Woodwell *et al.* 1977), and some have no net exchange (Nadeau 1972; Heinle and Flemer 1976). Haines (1977) has suggested on the basis of stable carbon isotope data that only a minor fraction of the organic seston in shallow salt marsh estuaries in Georgia is made up of marsh plant detritus, but since variability between systems is so high, her findings may not apply to other areas. Peterson *et al.* (1980) have suggested that the importance of the detritus may be to supply energy, rather than carbon, to the microbes. The lack of agreement as to the transport of detrital material into or out of marsh systems may be due to the large variability of hydrographic regimes in different marshes.

In order to examine the exchange of material between the emergent marsh and the estuary in North Carolina, we have constructed an energy budget for the emergent marsh at Walden Creek, part of the Cape Fear River Estuary system. This budget is a synthesis of our own measurements of the major pathways of energy flow through this site and adjacent sites (Blum *et al.* 1978; Cammen *et al.* 1980) plus values drawn from the literature to estimate the pathways which we did not measure. We have adjusted the literature values whenever possible to reflect the conditions present in our marsh. By including estimates of belowground production and release of dissolved organic carbon (DOC) by *Spartina alterniflora* and estimates of production of methane by sediment anaerobes, we have attempted to construct a complete and realistic budget. Since salt marshes along this section of the coast have received relatively little study despite the fact that impact from both development and industry is rapidly increasing, this energy budget will be useful in: 1) providing basic information into the functioning of the emergent marsh ecosystem in North Carolina, and 2) predicting and evaluating the effects of various management techniques on this system.

DESCRIPTION OF WALDEN CREEK MARSH

The study area was a *Spartina alterniflora* marsh located approximately 10 km from the mouth of the Cape Fear River Estuary, NC (33°55'N, 78°01'W). The marsh consisted of 23.6 ha short-form *Spartina* (<50 cm high), 63.8 ha medium *Spartina* (50–100 cm), and 18.9 ha tall *Spartina* (>100 cm), a total of 106.3 ha (Pendleton 1979). The marsh sediment had an organic content of 13–30% and temperatures at the marsh surface ranged from 2 to 42°C. The marsh is drained by Walden Creek which has a salinity range of 0 to 30‰ and a temperature range of 3 to 30°C (Laney 1981).

COMPONENTS OF THE MARSH ECOSYSTEM

The energy budget for Walden Creek marsh is presented in three sections. In the first section, separate energy budgets for functional components of the ecosystem are developed. These components include the *Spartina*, the benthic microalgae, the epiphytes, the fiddler crabs, the periwinkles, the insects, the mussels, the macrofauna, the meiofauna, and the microbiota. In the second section, the energy budget for the entire emergent marsh is presented. In the third section, we compare this energy budget with those developed for other marsh systems and discuss some of the factors affecting the form and amount of export of carbon to the Cape Fear River Estuary ecosystem.

Primary Producers

Spartina

Gross primary production (GPP) of the emergent marsh flora and respiration of both the flora and fauna were estimated by CO₂ analysis (described in Blum *et al.* 1978). Chambers were placed over several *Spartina* plants at low tide, sealed to the marsh surface, and monitored for changes in CO₂ concentration within light and dark chambers. Vegetable oil was used in the dark chambers to partition sediment respiration from aboveground respiration; however, the oil was not completely effective and $36 \pm 16\%$ of the sediment respiration was included in the measurement of aboveground respiration (Blum *et al.* 1978). We corrected for this error when calculating gross production and respiration (Appendix Section I).

Gross production (GPP) of *Spartina* was determined by correcting ecosystem GPP (Appendix Table 3) for the production contributed by the benthic microalgae: epiphytic production was insignificant (see below). Production of benthic microalgae was estimated from Pomeroy (1959) by assuming continuous exposure to air in order to simulate conditions in the chambers and was subtracted from ecosystem GPP to give *Spartina* GPP (Table 1).

Net primary production (NPP) of *Spartina* was estimated by subtracting *Spartina* respiration from GPP. Aboveground respiration of *Spartina*, as measured by Blum *et al.* (1978), included contributions from insects, arachnids and snails. We estimated faunal respiration (see later sections) and subtracted this amount from

Table 1. Gross primary production (GPP) of *Spartina*. Estimated annual gross production of benthic microalgae (Pomeroy 1959), calculated assuming continuous exposure, was subtracted from production estimates of the whole system (Appendix Table 3) to give *Spartina* gross production. Overall production takes into account the extent of each height-form in Walden Creek marsh. All values are kcal m⁻² yr⁻¹.

<i>Spartina</i> type	Total ecosystem GPP	Benthic algal GPP	<i>Spartina</i> GPP
Short	6916	970	5946
Medium	11,766	1280	10,486
Tall	15,678	1130	14,548
Overall	11,386	1184	10,201

Table 2. Respiration of *Spartina*. Estimated aboveground faunal respiration (including *Littorina*, insects and arachnids) was subtracted from estimates of total aboveground respiration (Appendix Table 3) to give aboveground *Spartina* respiration. Aboveground *Spartina* respiration was divided by the ratio of above- to belowground respiration (Appendix Section II) to give belowground *Spartina* respiration. Overall respiration takes into account the extent of each height-form in Walden Creek marsh. All values (except ratios) are kcal m⁻² yr⁻¹.

<i>Spartina</i> type	Total aboveground respiration	Faunal respiration	Aboveground <i>Spartina</i> respiration	Ratio of aboveground to belowground <i>Spartina</i> respiration	Belowground <i>Spartina</i> respiration
Short	590	101	489	0.72	679
Medium	2620	120	2500	1.87	1337
Tall	4528	1	4527	6.53	693
Overall	2509	95	2414		1076

total aboveground respiration to give aboveground *Spartina* respiration (Table 2). Using the estimated ratios of aboveground to belowground respiration, derived from measurements of short *Spartina* respiration in Georgia (Teal and Kanwisher 1961, 1966) and measurements of above- and belowground biomass in the three height-forms in Walden Creek marsh (Seneca *et al.* 1976) (see Appendix Section II for derivation), we estimated belowground *Spartina* respiration for the three marsh areas (Table 2). Finally, we subtracted the estimates of respiration from GPP to give NPP of *Spartina* (Table 3). Production was divided into aboveground and belowground portions using estimates from Blum *et al.* (1978) for belowground production (Table 3). *Spartina* NPP averaged 64–80% of GPP, lowest for tall and highest for short *Spartina* areas (Table 4).

Benthic Microalgae

Production of benthic microalgae was estimated from published data from other Atlantic Coast *Spartina* marshes. Annual gross production was estimated to be 79 g C m⁻² in tall *Spartina* and 99 g C m⁻² in short *Spartina* areas in a Delaware marsh (Gallagher and Daiber 1974). In Georgia estimated annual production (g C m⁻²), taking into account the actual time of exposure and submergence of the marsh surface, was 219 in tall, 193 in medium, and 172 in short *Spartina* areas

Table 3. Net primary production (NPP) of *Spartina*. Estimated total *Spartina* respiration (from Table 2) was subtracted from estimated gross production (Table 1) to give total net production. Belowground *Spartina* production (Blum *et al.* 1978) was subtracted from total net production to give aboveground net production. Overall values take into account the extent of each height-form in Walden Creek marsh. All values are kcal m⁻² yr⁻¹.

<i>Spartina</i> type	Total GPP	Total respiration	NPP		
			Total	Belowground	Aboveground
Short	5946	1168	4778	1869	2909
Medium	10,486	3837	6649	1806	4843
Tall	14,548	5220	9328	889	8439
Overall	10,201	3491	6711	1657	5054

Table 4. Summary of primary production in Walden Creek marsh. Overall values take into account the extent of each height-form in Walden Creek marsh. All values are in kcal m⁻² yr⁻¹.

<i>Spartina</i> type	NPP			Producer respiration			GPP		
	<i>Spartina</i>	Benthic algae	Total	<i>Spartina</i>	Benthic algae	Total	<i>Spartina</i>	Benthic algae	Total
Short	4778	1215	5993	1168	135	1303	5946	1350	7296
Medium	6649	1278	7927	3837	142	3979	10,486	1420	11,096
Tall	9328	1350	10,678	5220	150	5370	14,548	1500	16,048
Overall	6711	1277	7987	3491	142	3633	10,201	1419	11,620

(Pomeroy 1959). We used intermediate values (g C m⁻²) of 150 for tall, 142 for medium, and 135 for short *Spartina* areas as the annual gross production of benthic algae in this marsh. Net production was at least 90% of gross production (Pomeroy 1959); we assumed 90% and estimated total gross and net primary production for the marsh along with total producer respiration (Table 4), multiplying by 10 to convert g C to kcal for the benthic microalgae.

Epiphytes

Production by the epiphytes growing on *Spartina* was estimated from published data for two other North Carolina marshes (Lyon 1975). Epiphyte production in medium *Spartina* areas of those marshes was 2 g C hr⁻¹ plant⁻¹ when the plants were exposed and 55 g C hr⁻¹ plant⁻¹ when the plants were submerged. We estimated time of exposure of medium *Spartina* in this marsh with tide-height data taken each 30 min from March, 1975, to March, 1976, near Walden Creek and elevation of medium *Spartina* areas (Fig. 1). We assumed that epiphyte growth was limited to the lower half of the plants and thus estimated that medium *Spartina* epiphytes were submerged 1.4% of the time. With a 12-hr day and 226 plants m⁻² (Seneca *et al.* 1976) annual epiphyte production would have been 12.0 mg C plant⁻¹ or only 2.7 g C m⁻². The areas studied by Lyon (1975) had a greater abundance of epiphytes than the Walden Creek marsh; thus, epiphyte production was probably insignificant in relation to *Spartina* and benthic microalgae production and it will not be considered further.

Table 5. Release of dissolved organic carbon (DOC) by *Spartina*. To determine average submergence, the plants were divided into 3-cm sections, percent submergence calculated for each section, and the mean of the percents was calculated. Overall values take into account the extent of each height-form in Walden Creek marsh.

<i>Spartina</i> type	Average % sub- mer- gence	DOC release (kcal m ⁻² yr ⁻¹)	DOC release as % NPP	DOC release as % GPP
Short	0.9	315	6.6	5.3
Medium	0.6	596	9.0	5.7
Tall	7.7	2775	29.7	19.1
Overall		921	13.7	9.0

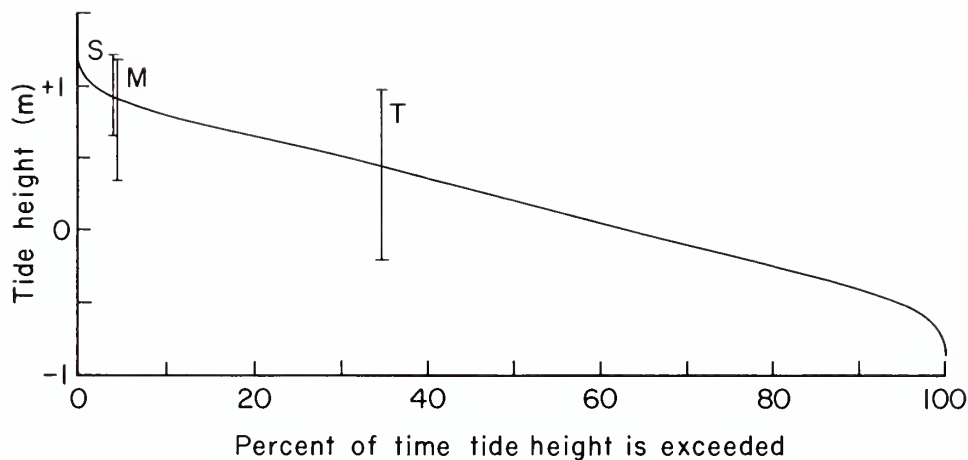


Fig. 1. Distribution of tide heights from March, 1975, to March, 1976, in Walden Creek along with the range in elevation (vertical bars) of the three marsh areas: short (S), medium (M), and tall (T). The intersection of the tide height distribution with the elevations of the marsh areas indicates the mean percent submergence for each area.

DOC Release from *Spartina*

From 5 to 19% of the gross production of *Spartina* was released as dissolved organic carbon (DOC), highest in tall *Spartina* and lowest in short *Spartina* (Table 5). Gallagher *et al.* (1976) found DOC release rates during submergence of 42 to $275 \mu\text{g C (g dry wt } Spartina)^{-1} \text{ hr}^{-1}$ in a Georgia marsh; however, the majority of measurements were between 42 and $163 \mu\text{g C g}^{-1} \text{ hr}^{-1}$. Turner (1978) found release rates ($\mu\text{g C g}^{-1} \text{ hr}^{-1}$) which varied from about 50 to 900 in another Georgia marsh, with a fall-winter average of about 225 and spring-summer average of about 430 (calculated from his Fig. 6, p. 447). Gallagher *et al.* (1976) apparently incubated their leaves in untreated marsh water while Turner used either filtered or artificial seawater. Since the microbial populations in natural marsh water utilize significant amounts of DOC (Gallagher *et al.* 1976), Turner's estimates were probably closer to the actual release by *Spartina*. Whole plants apparently release DOC at the same rate per unit weight as isolated leaves (Turner 1978). Therefore, we used an overall average release rate of $325 \mu\text{g C g}^{-1} \text{ hr}^{-1}$ for release of DOC by submerged *Spartina*. When *Spartina* was exposed, it released DOC at a rate of about $21 \mu\text{g C g}^{-1} \text{ hr}^{-1}$ (Turner 1978). We used the tide data taken near Walden Creek, the elevations of short, medium, and tall *Spartina* areas (Fig. 1), and the heights of the respective plants to estimate the average percent submergence for the plants in each area. With the percent submergence and the distribution of each height-form within the marsh, we calculated the overall release of DOC by living *Spartina* (Table 5).

After the *Spartina* dies, but before it falls to the marsh surface and decomposes completely, a small amount of DOC is released from the plants (Gallagher and Pfeiffer 1977). The average standing dead in this marsh (g dry wt m^{-2}) was 259 in short, 417 in medium, and 638 in tall *Spartina* areas (calculated from Seneca *et al.* 1976 and Stroud and Cooper 1968). With an average release rate of $140 \mu\text{g C (g dry wt)}^{-1} \text{ m}^{-2} \text{ hr}^{-1}$ (Gallagher and Pfeiffer 1977) and taking into account the amount of submergence, the release of DOC from standing dead *Spartina* (kcal

$\text{m}^{-2} \text{yr}^{-1}$) was estimated to be 27 in short, 26 in medium, and 541 in tall *Spartina*; the release rate for the marsh as a whole was $118 \text{ kcal m}^{-2} \text{yr}^{-1}$. Gallagher and Pfeiffer measured release from standing dead in the same manner as release from live plants (Gallagher *et al.* 1976). As a result, they probably underestimated the true release rate since they did not account for uptake of released DOC by microbes in the water during their incubations.

Biomass Production

Taking into account respiration and release of DOC by living plants, about 57% of the total gross production of *Spartina* was available for consumption by herbivores. Short *Spartina* was the most efficient producer of biomass (75% of gross production), medium *Spartina* was next (58%), and tall *Spartina* was least efficient (45%). Interestingly, even though gross production of tall *Spartina* was 2.4 times that of short *Spartina*, biomass production was only 1.5 times as much. Due to the compensating effects of respiration and DOC losses, production of *Spartina* biomass was fairly uniform across the marsh averaging $5789 \text{ kcal m}^{-2} \text{yr}^{-1}$. Considering the contribution of benthic microalgae as well, biomass production averaged $7066 \text{ kcal m}^{-2} \text{yr}^{-1}$.

Fiddler Crabs

Fiddler crabs of the genus *Uca* are widespread and abundant in salt marshes along the Atlantic and Gulf Coasts. Two species, *U. pugnax* and *U. minax*, were common in this marsh and a third species, *U. pugilator*, observed infrequently. Fiddler crabs are deposit feeders (Teal 1958; Marples 1966; Shanholtzer 1973) and do not feed directly on live *Spartina*. However, $^{13}\text{C}:^{12}\text{C}$ isotopic data indicate that much of the carbon in *U. pugnax* is derived from C_4 plants [probably *Spartina* (Haines 1976a,b)].

Samples from all three marsh types were taken seasonally from summer 1974 to summer 1975. Only crabs with carapace widths greater than 2 mm were retained. Using a population model developed from our field data along with equations derived from the literature relating growth, respiration and egestion rate to body size of the crabs and temperature, we estimated energy budgets for the two most abundant crabs, *U. pugnax* and *U. minax*; details have been presented elsewhere (Cammen *et al.* 1980).

Energy flow through the crabs was greatest in tall *Spartina* and least in short *Spartina* areas (Cammen *et al.* 1980). Production ($\text{kcal m}^{-2} \text{yr}^{-1}$) was 32 in short, 37 in medium, and 195 in tall *Spartina* areas while respiration ($\text{kcal m}^{-2} \text{yr}^{-1}$) was 40 in short, 72 in medium, and 269 in tall *Spartina*. On an overall basis, production was 64, respiration was 100, and total assimilation was $164 \text{ kcal m}^{-2} \text{yr}^{-1}$. The growth efficiency was 48% for *U. pugnax*, 23% for *U. minax*, and 39% for the combined crab populations.

Snails

The marsh periwinkle *Littorina irrorata* is also abundant in Atlantic and Gulf Coast salt marshes. *L. irrorata* graze on the stems of *Spartina* and on the sediment surface ingesting epiphytes, benthic algae, microbes, and plant detritus (Smalley 1958; Marples 1966; Alexander 1976, 1979); $^{13}\text{C}:^{12}\text{C}$ isotopic ratios in-

dicates that some of the carbon assimilated by the periwinkles may be derived from *Spartina* (Haines 1976b).

The periwinkles were sampled at the same times as the fiddler crabs. Since the population size was small in the tall *Spartina* areas, we concentrated our sampling in short and medium *Spartina* and assumed that energy flow through the tall *Spartina* areas was negligible. A population model similar to that developed from the fiddler crabs was used to predict energy flow through the periwinkles and the details have been presented elsewhere (Cammen *et al.* 1980).

Energy flow through *L. irrorata* was similar in both short and medium *Spartina* areas (Cammen *et al.* 1980). Production ($\text{kcal m}^{-2} \text{ yr}^{-1}$) was 8 in short and 9 in medium *Spartina*; respiration ($\text{kcal m}^{-2} \text{ yr}^{-1}$) was 100 in short and 119 in medium *Spartina*. On an overall basis production was 8, respiration was 93, and assimilation was $101 \text{ kcal m}^{-2} \text{ yr}^{-1}$. Growth efficiency for the periwinkles was only 8%.

Insects and Arachnids

Insect and arachnid populations in the marsh were sampled once each season. Sweep-nets were used to sample two 100 m^2 plots; a total of 1000 sweeps in sets of 100 were made within each plot with 5-min intervals between each set. The organisms were dried in the laboratory at $55\text{--}90^\circ\text{C}$ and a value of 5 kcal per g dry weight was used as a conversion factor.

Insect and arachnid standing stock was low in the marsh, ranging from 0.01 kcal m^{-2} in the winter to 0.23 kcal m^{-2} in the summer. The mean standing stock was 0.12 kcal m^{-2} . The insect population in another North Carolina salt marsh was assumed to turn over about three times each year (McMahan *et al.* 1972) and a grasshopper population in a Georgia marsh was estimated to turn over 2.8 times each year (Smalley 1958). Assuming three turnovers each year for the insects and arachnids in this marsh gives a production estimate of 0.4 kcal m^{-2} . The ratio between respiration and production in the grasshopper population was 1.7:1 (Smalley 1960) and this gives an estimate of 0.6 kcal m^{-2} for annual respiration for the insects and arachnids in this marsh. Total assimilation is estimated to be $1 \text{ kcal m}^{-2} \text{ yr}^{-1}$. Net growth efficiency for the insects and arachnids was 40%.

Mussels

The ribbed mussel *Geukensia demissa* (= *Modiolus demissus*) is found throughout Atlantic and Gulf Coast marshes. It commonly occurs in clumps attached to plant roots and each other by byssal threads. The mussels are filter feeders, consuming suspended detritus and algae (Kuenzler 1961).

Mussel populations in Walden Creek marsh were estimated from published data for other marshes. Mean population density in a Georgia marsh was 6.66 m^{-2} (Kuenzler 1961) and the mussels were completely absent from tall *Spartina* edge marsh. In three *Spartina* marshes near Beaufort, NC, densities ranged from $0.1\text{--}7.5$ mussels m^{-2} with an average of about 3 m^{-2} (Stiven and Kuenzler 1980). We have assumed that the population size in Walden Creek was similar to that in Georgia.

Energy flow was assumed to be the same as found in Georgia. Total assimilation of the mussels was estimated to be $56 \text{ kcal m}^{-2} \text{ yr}^{-1}$ of which 39 kcal were respired and 17 kcal were used for growth and gamete production (Kuenzler 1961). Net growth efficiency was 30%.

Macroinfauna

Macroinfaunal communities in North Carolina salt marshes are dominated by polychaete worms and isopods (Cammen 1979). These animals are mostly deposit feeders, utilizing benthic microalgae, detritus and its associated microbiota, and smaller metazoans.

Macroinfaunal standing stock was estimated from published data for other southeastern salt marshes. Macroinfaunal data from five other marshes were summarized by Cammen (1979); the range in average standing stock was 1.9–3.1 g ash-free dry weight m^{-2} . Average standing stocks of the three North Carolina marshes that have been studied ranged from 2.4–3.1 g ash-free dry weight m^{-2} (Cammen 1976, 1979). We have assumed an average standing stock of 3 g ash-free dry weight m^{-2} for this marsh; this is equivalent to 15 kcal m^{-2} if we assume that ash-free dry weight is 69% of dry weight for marsh macroinfauna (Cammen, unpublished data) and that 1 g dry weight is equivalent to 3.5 kcal (value for polychaetes from Cummins and Wuycheck 1971).

Production and respiration were also estimated from published values. A value of 2 has been used to convert average biomass to annual production when no better data were available (Sanders 1956; Gerlach 1971; Cammen 1976). In addition, the actual production:biomass (P/B) ratio for *Nereis succinea*, which dominated the macroinfauna of a *Spartina* marsh near Beaufort, NC, was 1.97 (Cammen 1980). With a P/B ratio of 2 for the macroinfauna in this marsh, annual production was 30 kcal m^{-2} . The ratio between production and respiration (P/R) for *Nereis succinea* was 2.1:9.4 in the salt marsh near Beaufort. Using this P/R ratio for the macroinfauna in this marsh, annual respiration was 134 kcal m^{-2} .

The completed annual energy budget for the macroinfauna in this marsh has a production of 30 kcal m^{-2} and respiration of 134 kcal m^{-2} for an average standing stock of 15 kcal m^{-2} . The growth efficiency for the macroinfauna was 18%.

Meiofauna

Nematodes dominate the meiofauna in salt marshes both in terms of numbers and biomass (Rogers 1969; Brickman 1972; Sikora *et al.* 1977). For example, in a *Spartina* marsh in New Jersey, the nematodes accounted for 97% of the total meiofaunal numbers and 93% of the biomass (Brickman 1972). Therefore, we have concentrated on the nematode fauna in this study. Nematodes feed on benthic algae and microbes in addition to preying on other meiofauna (Coull 1973; Tietjen and Lee 1977).

Standing stock of the meiofauna was estimated using literature values from other salt marsh studies. We converted the various biomass measures used in other studies of marsh nematodes to energy by assuming that dry weight was 25% of wet weight (Wieser 1960) and 1 g dry weight was equivalent to 3.84 kcal (derived from Sikora *et al.* 1977). Average standing stocks of nematodes in tall *Spartina* areas in other marshes (kcal m^{-2}) were 26.3 in New Jersey (Brickman 1972), 24.2 in South Carolina (Sikora *et al.* 1977), 8.4–17.7 in Massachusetts (Wieser and Kanwisher 1961), and 0.2–7.3 in Georgia (Teal and Wieser 1966).

Although nematodes were more numerous in the Georgia marsh ($12.9 \times 10^6 \text{ m}^{-2}$) than in the other marshes (NJ, $4.3 \times 10^6 \text{ m}^{-2}$; SC, $2.2 \times 10^6 \text{ m}^{-2}$; MA, $1.4\text{--}2.1 \times 10^6 \text{ m}^{-2}$), the standing stock in Georgia was much lower than the others because the mean individual size of the Georgia nematodes was less (GA, 0.15

μg dry weight individual⁻¹; MA, 1.55–2.19; NJ, 1.59; SC, 2.83). The data from the Massachusetts marsh came from an area adjacent to a salt marsh, but not actually within the area covered by *Spartina* growth. Therefore, for this study we considered the best estimates of nematode biomass to be those found in New Jersey and South Carolina and we assumed an average nematode biomass of 25 kcal m⁻². If nematodes were 93% of total meiofaunal biomass as in New Jersey (Brickman 1972), then total meiofaunal biomass in tall *Spartina* was 27 kcal m⁻². The only applicable information on distribution of the meiofauna within the marsh is from Georgia (Teal and Wieser 1966) where nematode standing stocks had a ratio of 14.3:4.9:1 for tall:medium:short *Spartina*. We apportioned total meiofaunal biomass with these ratios to give average standing stocks (kcal m⁻²) of 27 for tall, 9 for medium, and 2 for short *Spartina*. Taking into account the distribution of the three *Spartina* types in this marsh, the average meiofaunal biomass was 10.7 kcal m⁻².

Respiration and production of the meiofauna were also estimated from literature values. Average respiration rates of nematodes from two locations in a Massachusetts salt marsh were 755 and 586 mm³O₂ (g wet weight)⁻¹ hr⁻¹ at 20°C (mean of 670 mm³O₂ g⁻¹ hr⁻¹) (Wieser and Kanwisher 1961). Respiration rates of nematodes from a Georgia marsh averaged 625 mm³O₂ g⁻¹ hr⁻¹ at 20°C (Teal and Wieser 1966). In a summary of all the available respiration data on marine meiofauna, median respiration for all taxa other than nematodes was 420 mm³O₂ g⁻¹ hr⁻¹ (Gerlach 1971). Since the nematodes dominate the meiofauna, we used 650 mm³O₂ (g wet weight)⁻¹ hr⁻¹ as the average respiration for the meiofauna in this marsh. With an oxy-calorific coefficient of 4.8 cal (ml O₂)⁻¹ and a conversion factor of 1 g wet weight of meiofauna (nematodes) to 0.96 kcal, this respiration rate is equivalent to 28.5 kcal respired (kcal biomass)⁻¹ yr⁻¹; this rate is for 20°C which is in the middle of the yearly temperature range for this marsh. With this value we estimated annual respiration (kcal m⁻²) to be 57 in short, 257 in medium, and 770 in tall *Spartina*. Gerlach (1971) estimated that annual meiofauna production averages nine times the mean standing stock. Meiofauna production in this marsh (kcal m⁻² yr⁻¹) was thus estimated as 18 in short, 81 in medium, and 243 in tall *Spartina* areas.

The annual energy budget for the meiofauna on a whole marsh basis showed a production of 96 kcal m⁻² and respiration of 304 kcal m⁻². The growth efficiency for the meiofauna was 24%.

Sediment Microbiota

The sediment heterotrophic microbiota consists of bacteria, fungi and protozoans. These organisms are responsible for most of the decomposition of organic material in the marsh.

No direct measurement of energy flow was made for individual components of the sediment system, but total aerobic respiration was measured by Blum *et al.* (1978). We subtracted the respiration attributable to belowground *Spartina*, benthic microalgae, fiddler crabs, macroinfauna and meiofauna to obtain an estimate of aerobic respiration for the microbiota (Table 6).

Energy loss from the sediment through anaerobic metabolism was estimated to range from 0.1 to 15% of the energy lost through aerobic metabolism, greatest in short *Spartina* and least in tall *Spartina* areas (Table 6). These estimates were

Table 6. Respiration of microbes and total sediment. Sediment respiration was calculated from Blum *et al.* (1978) using *Spartina* respiration from this paper. All values are in kcal m⁻² yr⁻¹. Overall respiration takes into account the extent of each height-form in Walden Creek marsh.

<i>Spartina</i> type	Microbial			Total sediment (aerobic)
	Aerobic	An-aerobic	Total	
Short	3287	507	3794	4332
Medium	3575	131	3706	5517
Tall	4989	4	4993	7005
Overall	2763	192	3955	5519

based on measurements of methane release from a Georgia marsh (g CH₄-C m⁻² yr⁻¹): 53.1 for short and 0.41 for tall *Spartina* (King and Wiebe 1978); release from medium *Spartina* areas is about 15 g CH₄-C m⁻² yr⁻¹ (W. Wiebe, personal communication). These release rates were measured only when the marsh surface was exposed, but in short and medium *Spartina* where methane production is greatest, the marsh surface is exposed 94–95% of the time. Therefore, these estimates should be close to the actual value for the marsh as a whole.

Annual production of the microbiota was estimated by summing losses to the meiofauna, macroinfauna, and fiddler crabs. A steady-state condition exists in salt marshes for both bacterial standing stock (Ruble, in press) and total microbial carbon (Christian *et al.* 1975; Rublee, in press), which implies that any temporary increase in microbial biomass is either consumed or exported. The minimum energy required by the meiofauna, macroinfauna, and fiddler crabs was the amount respired (kcal m⁻² yr⁻¹): 231 in short, 463 in medium, and 1173 in tall *Spartina*; the maximum energy required was the amount assimilated (kcal m⁻² yr⁻¹): 311 in short, 611 in medium, and 1641 in tall *Spartina*. The actual energy required by these fauna was between these values since some of the meiofaunal and macroinfaunal production represented recycling within the respective trophic groups. Therefore, on an overall marsh basis, the energy required by all the consumers was between 538 and 728 kcal m⁻² yr⁻¹. Not all of this energy came from the microbes, however. In another North Carolina marsh, the most abundant polychaete, *Nereis succinea*, obtained only 13% of its requirement of "microbial" carbon (Cammen 1980); since the measurement of "microbial" carbon in that study may have included some meiofaunal carbon, 13% represented the maximum contribution of the microbes to the carbon budget of the worms. If 13% of the energy assimilated by the meiofauna, macroinfauna, and fiddler crabs in this marsh came from the microbes, then microbial production (kcal m⁻² yr⁻¹) was at least 30–40 in short, 60–79 in medium, and 152–213 in tall *Spartina*. On a whole marsh basis, microbial production was between 70 and 95 kcal m⁻² yr⁻¹.

Total energy flow through the microbes (kcal m⁻² yr⁻¹) was thus estimated as 3824–3834 in short, 3766–3785 in medium, and 5145–5206 in tall *Spartina*. On a whole marsh basis, energy flow through the microbes averaged 4025–4050 kcal m⁻² yr⁻¹. Net growth efficiency for the microbes was only 2%.

DOC Release From Sediment

Release of DOC from the sediment resulting from microbial action on decomposing *Spartina* and loss from benthic microalgae was relatively minor in the

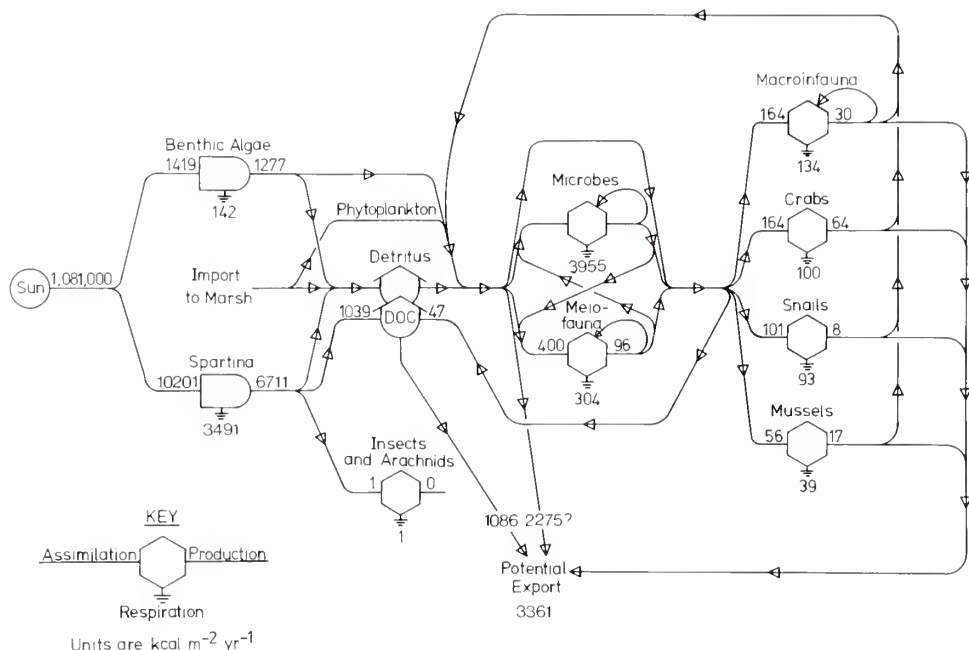


Fig. 2. Energy flow diagram for Walden Creek marsh. The diagram is intended to show the many alternate pathways for energy flow through the system and the magnitude of these flows where they are known. Circle (Sun) represents an energy source, bullet-shapes (*Spartina*, benthic algae) represent primary producer populations, roofed semi-circles (detritus, DOC) represent passive storage, and hexagons (microbes, meiofauna, insects and arachnids, macroinfauna, crabs, snails, mussels) represent consumer populations. Flows in and out of the compartments are explained in the lower left corner.

marsh. We used a release rate of $6 \text{ mg C m}^{-2} \text{ hr}^{-1}$, estimated from measurements taken in tall and short *Spartina* areas in a Georgia marsh (Pomeroy *et al.* 1977); there was no significant difference in release rate between tall and short *Spartina*. We assumed that release of DOC from the sediment could occur only when the marsh surface was inundated and calculated release rates ($\text{kcal m}^{-2} \text{ yr}^{-1}$) of 20 in short, 22 in medium and 165 in tall *Spartina* areas. The overall marsh average was a release from the sediment of $47 \text{ kcal m}^{-2} \text{ yr}^{-1}$ as DOC.

Secondary Consumers

Secondary consumers in this marsh consisted of the arachnids (discussed previously), the marsh crab *Sesarma* spp., the rice rat *Oryzomys palustris*, and some 60 species of birds. Quantitative population data were collected only for the arachnids, but in other marshes the other taxa were found to be relatively unimportant in the total energy flow, at least as far as the fraction of the total production they consume (Teal 1962; Day *et al.* 1973; Nixon and Oviatt 1973). Therefore, we have not attempted to include these other taxa in this energy budget.

COMMUNITY ENERGY FLOW

The information on component energy flow from the previous sections has been summarized in Fig. 2 and Table 7. The data were summarized in Table 7 by

Table 7. Summary of energy flow through Walden Creek marsh. All values are kcal m⁻² yr⁻¹.

Functional group	Input	Output	Efficiency
Insolation	—	1,081,000 ^a	—
Primary producers	1,081,000	7987	0.7%
Microbiota	4025–4050	70–95	1.7–2.4%
Infauna	564	126	22.3%
Epifauna	322	89	27.6%

^a Calculated from data in Blum *et al.* 1978.

functional groups, not by trophic levels since we felt that in a salt marsh system such as Walden Creek, where detritus is so important, any division into trophic levels would have been too artificial. Most of the fauna are omnivorous, feeding on a variety of smaller animals, detritus, benthic microalgae and microbes.

Gross production in the marsh was 1.1% of the incident solar energy (Fig. 2); net production was 0.7% of the solar input. *Spartina* accounted for 88% of gross and 84% of net production; benthic microalgae accounted for the remainder. The producers in the marsh respired 31% of their gross production.

Only a minor portion of net production was utilized to produce faunal biomass. The consumers in the marsh assimilated the equivalent of 11% of the total net production in the marsh. Of this amount about 8% was respired and 3% went to growth. The infauna (macroinfauna and meiofauna) accounted for 64% of the faunal assimilation and 59% of the production. The meiofauna were the most significant faunal component in the marsh, accounting for 45% of both assimilation and production.

More than half of the net production in the marsh was utilized by the microbiota and 98% of this amount was respired. Estimated microbial production was only 33–44% of the production of the infauna and epifauna.

Approximately 42% of the net production was potentially available for export to Walden Creek (Table 8); this was equivalent to an export of 53% of the above-ground net production. About 32% of this material was in the form of DOC on a

Table 8. Estimate of net ecosystem productivity (NEP) or material available for export from Walden Creek marsh. All values are kcal m⁻² yr⁻¹. Overall values take into account the extent of each height-form in Walden Creek marsh.

	<i>Spartina</i> type			Overall
	Short	Medium	Tall	
NPP	5993	7927	10,678	7987
Microbial and faunal respiration ^a	–4165	–4328	–6206	–4626
NEP or potential export	1828	3599	4472	3361
DOC release from live plants, standing dead, and sediment	–362	–644	–3481	–1086
Potential export of particulate material	1466	2955	991	2275
% NEP of NPP	31	45	42	42
% particulate of NEP	80	82	22	68

^a Includes methane production.

whole marsh basis, but as much as 78% of the export from tall *Spartina* could have been in the form of DOC. On a whole marsh basis, an average of 2275 kcal m⁻² yr⁻¹ was available for export as particulate matter and 1086 kcal m⁻² yr⁻¹ was available for export as DOC.

DISCUSSION

Previous salt marsh energy budgets may have greatly underestimated the efficiency of the major primary producer, *Spartina alterniflora*. Net production in Walden Creek marsh was about 66% of gross production as compared to only 23% in Georgia (Teal 1962) and 18% in Louisiana (Day *et al.* 1973). This difference is the result of a discrepancy in respiration estimates among the studies. Assuming that *Spartina* dry weight is 33% of wet weight (Reimold *et al.* 1973) and that 1 g dry weight is equivalent to 3.7 kcal (Blum *et al.* 1978), the ratios of respiration to mean aboveground standing stock of *Spartina* [kcal respired yr⁻¹ (g dry weight)⁻¹] were 64.9 in Georgia, 65.5 in Louisiana, and only 6.3 in Walden Creek. On the other hand, the ratios of net production to weight [kcal yr⁻¹ (g dry weight)⁻¹] were similar: 15.3 in Georgia, 14.0 in Louisiana, and 13.0 in Walden Creek marsh. Respiration estimates for both the Georgia and Louisiana marshes were based on measurements by Teal and Kanwisher (1961) of plants from Georgia and assumed that respiration was continuous for both light and dark periods. However, since *Spartina* is a C₄ plant, the aboveground portion respire only in the dark (Black 1973); this would explain about half the difference between the respiration estimates. In addition, the chambers used by Teal and Kanwisher (1961) were short enough to require that the plants be bent over and this may have increased the respiration rate; the chambers used by Blum *et al.* (1978) were tall enough to fully accommodate the plants. Teal (1962) has suggested that, due to the osmotically difficult environment in which *Spartina* lives, respiratory costs are relatively high. Respiration of *Typha* in a freshwater marsh in Minnesota was only 15% of gross production, for example (Bray 1962). However, we estimate that the *Spartina* in Walden Creek respired only 34% of the gross production which suggests that the energetic costs of surviving in the salt marsh environment are not as high as previously thought.

The energetics of the belowground portion of the *Spartina* plants, although significant, has not been included in other marsh energy budgets. We have estimated that the belowground biomass accounted for 24% of the gross production, 30% of the primary producer respiration, and 21% of the net production in the marsh; these portions may be even higher in other areas. Belowground production has been estimated to contribute as much as 78 to 89% of *Spartina* net production in a Massachusetts salt marsh (Valiela *et al.* 1976) and belowground production in Georgia was about 62% of total net production (Smalley 1958; Gallagher and Plumley 1979). Most of the belowground production probably remains in the marsh sediment and is ultimately respired by microbes or buried. Some of the material will be brought to the surface by burrowers such as fiddler crabs, however, and may then be exported from the marsh. A portion of belowground production will be lost in the form of root exudates to the surrounding sediment and this material should be rapidly metabolized by the microbial community around the roots.

Loss of organic carbon from the marsh in non-particulate form was significant.

The release of DOC from live *Spartina*, decaying litter, and sediment, and the loss of methane from the marsh surface accounted for 16% of the net production in the marsh and 38% of the production remaining after microbial and faunal respiration. The DOC is likely to be a high quality food source for the microbes in the estuarine water column, but represents a portion of the production otherwise unavailable to consumers. Once the methane escapes from the sediment surface of the marsh, it is probably lost to the ecosystem; in earlier budgets methane loss was tacitly included as export since it was not actually considered.

Only 8% of the energy fixed by the primary producers was respired by the meio- and macrofauna of the marsh. This pattern was similar to that seen in the other southeast marshes: Georgia, where 8% of net production was respired by consumers (Teal 1962); and in Louisiana, where 10% was respired (Day *et al.* 1973). In the Massachusetts marsh only 2% of net production was respired by the fauna (Howarth and Teal 1980).

Most of the energy lost from the marsh by respiration was due to the heterotrophic microbes, which respired the equivalent of 50% of the net production. Microbial production was at least 2% of the net production since that amount was consumed by larger organisms. We do not know how much of the respiration and production were due to the separate components of the microbial community, namely the bacteria, fungi, and microfauna. Some of the assimilated net production may have been released by the microbes as DOC, but judging from the small amount of DOC released from the sediment, this release was probably not important in the overall energy budget.

The insects and arachnids appeared to be less important in Walden Creek marsh than in other marshes which have been studied. In Georgia, energy flow through the insects was estimated to be $305 \text{ kcal m}^{-2} \text{ yr}^{-1}$ (Teal 1962) as compared to $1 \text{ kcal m}^{-2} \text{ yr}^{-1}$ in this marsh; energy flow through the insects in a Louisiana marsh was estimated as $26 \text{ g organic matter m}^{-2} \text{ yr}^{-1}$ (Day *et al.* 1973), which is equivalent to about $120 \text{ kcal m}^{-2} \text{ yr}^{-1}$. The value from Louisiana is questionable, however, since the insects were assumed to respire $0.7 \text{ g organic matter (g dry body weight)}^{-1} \text{ day}^{-1}$. Insect dry weight is generally over 90% organic matter (Cummins and Wuycheck 1971), so the rate assumed by Day *et al.* represents a minimum loss equivalent to 70% of insect body weight daily; over a 3-month period the grasshopper population investigated by Smalley (1958) respired the equivalent of only 5% of their standing stock daily. Kuenzler (1961) pointed out that Smalley's study of grasshopper energy flow was carried out in tall *Spartina* areas, which are the most favorable habitat in the marsh for grasshoppers; Teal (1962) assumed that these values were typical of the marsh as a whole, which resulted in an overestimate of their contribution to the total marsh energy flow. Our values for insect and arachnid standing stock may have been underestimates since organisms were still being collected on the final sweeps, but even if the actual standing stock were twice as high as our estimate, the energy flow would still have been negligible. Insects living within the stems of *Spartina*, which have not been considered here or in any of the other marsh energy flow studies, may consume significant amounts of plant tissue (M. Newton, Department of Entomology, North Carolina State University, Raleigh).

The equivalent of 42% of the net production was not dissipated in the marsh and was presumably available for export into Walden Creek (Table 8). Of this amount, 14% was accounted for as DOC and probably was exported. The fate of

the remaining 28% in the form of particulate matter was uncertain. Some of this material was exported but some was also incorporated into the sediment. Accretion often occurs in marshes (Redfield 1972), but no estimates were available of accretion rate for Walden Creek marsh. Some simple calculations can be made, however, to examine the range of possibilities. If no sediment was accreting, then all the particulate material, or $2275 \text{ kcal m}^{-2} \text{ yr}^{-1}$ (Table 8), would have been exported from the marsh. On the other hand, if no export of particulate material were occurring, then the marsh would have been accreting an average of 4 mm of sediment each year; this calculation assumes that the newly accreted sediment has the same organic content as the existing sediment (25%), that the density of the sediment is $0.6 \text{ g dry wt cm}^{-3}$ (R. A. Linthurst, Department of Botany, North Carolina State University, Raleigh), and that 1 g of accreted organic matter is the equivalent of 3.7 kcal (overall marsh average). Accretion in a Long Island salt marsh was estimated to be $2.0\text{--}4.25 \text{ mm yr}^{-1}$ (Richard 1978) and if the accretion rate in Walden Creek marsh were near the upper end of this range, then export of particulate matter from the marsh would be minimal. Export of material from Walden Creek (Pendleton 1979) was equivalent to 8911 kcal m^{-2} of marsh as DOC and 466 kcal m^{-2} of marsh as particulate carbon, but these amounts do not necessarily represent export from the marsh for two reasons: 1) some of the material exported from the marsh is undoubtedly metabolized or retained in Walden Creek itself without ever being exported from the creek; and 2) there is probably additional input of material to Walden Creek from upstream pocosin and forest areas (Pendleton 1979). In the case of DOC in particular, release from the marsh was estimated to be 1086 kcal m^{-2} (Table 8), much less than the amount actually exported from Walden Creek.

Potential export of material from Walden Creek marsh was similar to that estimated for other southeast marshes. Potential export from Walden Creek marsh was estimated to be 42% of net production as compared to 45% in Georgia (Teal 1962) and 50% in Louisiana (Day *et al.* 1973). The Georgia and Louisiana studies did not consider belowground production, and, therefore, underestimated net production of the marshes; since export was calculated by subtracting faunal and microbial respiration from net production, the result was an underestimate of potential export equal to the underestimate in net production. Comparison between the marshes is also complicated by large differences in estimated microbial and faunal respiration. Despite having similar aboveground production ($\text{kcal m}^{-2} \text{ yr}^{-1}$)—Walden Creek, 6331; Georgia, 8205; Louisiana, 6948 [assuming organic matter is 50% C and $9 \text{ kcal (g C)}^{-1}$ —microbial and faunal respiration was much greater in Walden Creek marsh ($4626 \text{ kcal m}^{-2} \text{ yr}^{-1}$) than in Georgia (3090, excluding planktonic respiration) or Louisiana (3393, assuming organic matter is 50% C and $9 \text{ kcal (g C)}^{-1}$). We measured respiration directly throughout the year (Blum *et al.* 1978), while the Georgia value was based on only one measurement in each of the three different marsh areas (Teal and Kanwisher 1961) and the Louisiana value was obtained by estimating faunal respiration and assuming the same ratio between faunal and microbial respiration as found in Georgia. Based on annual temperature range it is unlikely that microbial and faunal respiration was actually less in the Georgia and Louisiana marshes than in Walden Creek and, therefore, we feel that respiration was underestimated in the previous studies. If we assume that the ratio between aboveground and belowground production was similar for all three marshes and that our respiration values would apply

to all three marshes, then potential export would be 42–55% of net production. Most export probably comes from aboveground material and these figures are equivalent to an export of 53–70% of the aboveground production. Comparable figures for the Massachusetts marsh (Howarth and Teal 1980) show an export of organic carbon equivalent to only 7% of net production, but 56% of aboveground production; the discrepancy is due to the substantial belowground *Spartina* production (about 88% of total).

We have not included energy transfer through the anaerobic processes of denitrification (respiration of organic matter using nitrate as the terminal electron acceptor) and sulfate reduction (respiration of organic matter using sulfate as the terminal electron acceptor). Denitrification has been measured for a Massachusetts salt marsh and accounted for the respiration of less than 0.1% of the belowground production (Kaplan *et al.* 1979). Sulfate reduction was the main pathway for organic matter decomposition in the Massachusetts salt marsh, possibly accounting for all the belowground production (Howarth and Teal 1980). In addition, as much as one-third of all the reduced end-products may have moved through the sediment to tidal creeks where it was exported from the marsh system (Howarth and Teal 1980). Since belowground production in Walden Creek marsh (Table 3) was much less than in the Massachusetts marsh (Valiela *et al.* 1976), we could predict the sulfate reduction would also be less. However, it is not possible to predict the proportion of reduced end-products that might be exported from the marsh in the waters of Walden Creek since we have no knowledge of the flow through the marsh sediment.

Since there were a variety of sources of organic material available to the organisms in the marsh, including imported material, it was not possible to determine the exact fate of the primary production of the marsh. It is necessary to think of the animals as consuming the "equivalent" of some portion of the net production, since an unknown fraction of this material may have been phytoplankton or suspended detritus carried into the marsh with the tide. In addition, estimates of transport of material into or out of marshes actually are estimates of net transport only. It is possible in a system such as Walden Creek marsh that much of the aboveground production could actually be exported from the marsh but replaced by an equivalent amount of imported material from upstream; net export would be zero, but also a poor measure of the functioning of the system. This problem is important because the material leaving the marsh may be younger and less refractory, and thus more nutritious, than the older material entering the marsh. Even though the marsh did not appear to be important quantitatively in the carbon budget of Walden Creek, the material coming from the marsh may be increasing the quality of the food supply for estuarine detritivores. Indeed, the fact that it is difficult to find evidence of *Spartina* detritus in the waters surrounding Georgia marshes using isotopic ratios (Haines 1977) may actually be an indication of how rapidly the exported material is being utilized. This effect may be especially significant in Walden Creek itself where a large export of energy to the Cape Fear Estuary in the form of juvenile shrimp and fish is supported (Laney 1981; Pendleton 1979).

ACKNOWLEDGEMENTS

This research was part of the Cape Fear Estuarine Program associated with the Brunswick Steam Electric Plant and was supported by Carolina Power and

Light Company. We wish to thank E. C. Pendleton, R. W. Laney, P. A. Rublee, and R. A. Linthurst for numerous discussions and for generously allowing the use of unpublished data. We also wish to thank L. L. Hobbs for technical assistance in the field. S. C. Mozley, J. F. Reynolds, and A. M. Witherspoon reviewed the manuscript. Paper No. 5941 of the Journal Series of the North Carolina Agricultural Research Service, Raleigh, NC 27650.

LITERATURE CITED

- Alexander, S. K. 1976. Relationship of macrophyte detritus to the salt marsh periwinkle, *Littorina irrorata* Say. Ph.D. Thesis, Louisiana State Univ., Baton Rouge. 104 p.
- 1979. Diet of the periwinkle *Littorina irrorata* in a Louisiana salt marsh. Gulf Research Reports 6: 293–295.
- Axelrad, D. M., K. A. Moore, and M. E. Bender. 1976. Nitrogen, phosphorus and carbon flux in Chesapeake Bay marshes. Bulletin 79, Virginia Water Resources Research Center, Virginia Polytechnic Institute, Blacksburg. 182 p.
- Birkhead, W. S., C. R. Bennett, E. C. Pendleton, and B. J. Copeland. 1977. Nursery utilization of the Dutchman Creek Estuary, N. C., 1971–1976. Report to Carolina Power and Light Company, Raleigh, NC. 374 p.
- Black, C. C., Jr. 1973. Photosynthetic carbon fixation in relation to net CO₂ uptake. Annual Review of Plant Physiology 24: 253–286.
- Blum, U., E. D. Seneca, and L. M. Stroud. 1978. Photosynthesis and respiration of smooth cordgrass, *Spartina alterniflora*, and black needlerush, *Juncus roemerianus*, in North Carolina salt marshes: some models. Estuaries 1: 228–238.
- Boon, J. D., III. 1974. Sediment transport processes in a salt marsh drainage system. Ph.D. Thesis, College of William and Mary, Williamsburg, VA. 238 p.
- Bray, J. R. 1962. Estimates of energy budgets for a *Typha* (cattail) marsh. Science 136: 1119–1120.
- Brickman, L. M. 1972. Base food chain relationships in coastal salt marsh ecosystems. Ph.D. Thesis, Lehigh Univ., Bethlehem, PA. 179 p.
- Cammen, L. M. 1976. Abundance and production of macroinvertebrates from natural and artificially established salt marshes in North Carolina. American Midland Naturalist 96: 487–493.
- 1979. The macro-infauna of a North Carolina salt marsh. American Midland Naturalist 102: 244–253.
- 1980. The significance of microbial carbon in the nutrition of the deposit feeding polychaete *Nereis succinea*. Marine Biology 61: 9–20.
- Cammen, L. M., E. D. Seneca, and L. M. Stroud. 1980. Energy flow through the fiddler crabs *Uca pugnax* and *U. minax* and the marsh periwinkle *Littorina irrorata* in a North Carolina salt marsh. American Midland Naturalist 103: 238–250.
- Christian, R. R., K. Bancroft, and W. J. Wiebe. 1975. Distribution of microbial adenosine triphosphate in salt marsh sediments at Sapelo Island, Georgia. Soil Science 119: 89–97.
- Copeland, B. J. and R. G. Hodson. 1977. Larvae and post-larvae in the Cape Fear Estuary, N.C.—1976–1977. Report to Carolina Power and Light Company, Raleigh, NC. 46 p.
- Coull, B. C. 1973. Estuarine meiofauna: A review: Trophic relationships and microbial interactions, pp. 499–512. In L. H. Stevenson and R. R. Calwell (eds.), Estuarine Microbial Ecology. Univ. of South Carolina Press, Columbia.
- Cummins, K. W. and J. C. Wuycheck. 1971. Caloric equivalents for investigations in ecological energetics. Internationale Vereinigung für Theoretische und Angewandte Limnologie. Mitteilungen 18: 1–158.
- Daiber, F. C. 1974. Tidal marshes of Delaware, pp. 99–149. In H. T. Odum, B. J. Copeland and E. A. McMahan (eds.), Coastal Ecological Systems of the United States, Vol. II. The Conservation Foundation, Washington, DC.
- Day, J. W., Jr., W. B. Smith, P. R. Wagner, and W. C. Stowe. 1973. Community structure and carbon budget of a salt marsh and shallow bay estuarine system in Louisiana. Center for Wetland Resources Publ. LSU-SG-72-04. Louisiana State Univ., Baton Rouge. 79 p.
- Gallagher, J. L. and F. C. Daiber. 1974. Primary production of edaphic algal communities in a Delaware salt marsh. Limnology and Oceanography 19: 390–395.
- Gallagher, J. L. and W. J. Pfeffer. 1977. Aquatic metabolism of the communities associated with attached dead shoots of salt marsh plants. Limnology and Oceanography 22: 562–565.

- Gallagher, J. L. and F. G. Plumley. 1979. Underground biomass profiles and productivity in Atlantic coastal marshes. *Amer. J. of Botany* 66: 156-161.
- Gallagher, J. L., W. J. Pfeffer, and L. R. Pomeroy. 1976. Leaching and microbial utilization of dissolved organic carbon from leaves of *Spartina alterniflora*. *Estuarine and Coastal Marine Science* 4: 467-471.
- Gerlach, S. A. 1971. On the importance of marine meiofauna for benthos communities. *Oecologia* 6: 176-190.
- Gosselink, J. G., E. P. Odum, and R. M. Pope. 1974. The value of the tidal marsh. Center for Wetland Resources Publ. LSU-SG-74-03. Louisiana State Univ., Baton Rouge. 30 p.
- Hackney, C. T. 1977. Energy flux in a tidal creek draining an irregularly flooded *Juncus* marsh. Ph.D. Thesis, Mississippi State Univ., State College. 83 p.
- Haines, E. B. 1976a. Relation between the stable carbon isotope composition of fiddler crabs, plants, and soils in a salt marsh. *Limnology and Oceanography* 21: 880-883.
- . 1976b. Stable carbon isotope ratios in the biota, soils and tidal water of a Georgia salt marsh. *Estuarine and Coastal Marine Science* 4: 609-616.
- . 1977. The origins of detritus in Georgia salt marsh estuaries. *Oikos* 29: 254-260.
- Heinle, D. R. and D. A. Flemer. 1976. Flows of materials between poorly flooded tidal marshes and an estuary. *Marine Biology* 35: 359-373.
- Howarth, R. W. and J. M. Teal. 1980. Energy flow in a salt marsh ecosystem: The role of reduced inorganic sulfur compounds. *Amer. Nat.* 116: 862-872.
- Kaplan, W., I. Valiela, and J. M. Teal. 1979. Dinitrification in a salt marsh ecosystem. *Limnology and Oceanography* 24: 726-734.
- King, G. M. and W. J. Wiebe. 1978. Methane release from soils of a Georgia salt marsh. *Geochimica et Cosmochimica Acta* 42: 343-348.
- Krebs, C. T. 1976. Population dynamics and energetics of the fiddler crab *Uca pugnax* and the effect of contamination with chlorinated hydrocarbons from sewage. Ph.D. Thesis, Boston Univ., Massachusetts. 141 p.
- Kuenzler, E. J. 1961. Structure and energy flow of a mussel population in a Georgia salt marsh. *Limnology and Oceanography* 6: 191-204.
- Laney, R. W. 1981. Population dynamics of penaeid shrimp in two North Carolina tidal creeks. Ph.D. Thesis, North Carolina State Univ., Raleigh. 161 p.
- Lyon, J. T. 1975. A comparison of epiphytes on natural and planted *Spartina alterniflora* marshes. M.S. Thesis, North Carolina State Univ., Raleigh. 34 p.
- Marples, T. G. 1966. A radionuclide tracer study of arthropod food chains in a *Spartina* salt marsh ecosystem. *Ecology* 47: 270-277.
- McHugh, J. L. 1966. Management of estuarine fisheries. In *Symposium on Estuarine Fisheries*, pp. 133-154. American Fisheries Society Special Publication 3.
- McMahan, E. A., R. L. Knight, and A. R. Camp. 1972. A comparison of microarthropod populations in sewage-exposed and sewage-free *Spartina* salt marshes. *Environmental Entomology* 1: 244-252.
- Nadeau, R. J. 1972. Primary production and export of plant materials in the salt marsh ecosystem. Ph.D. Thesis, Rutgers Univ., New Brunswick, NJ. 167 p.
- Newsom, J. D. 1968. Proceedings of the marsh and estuary management symposium. Louisiana State Univ. Division of Continuing Education, Baton Rouge. 250 p.
- Nixon, S. W. and C. A. Oviatt. 1973. Ecology of a New England salt marsh. *Ecological Monographs* 43: 463-498.
- Odum, E. P. 1961. The role of tidal marshes in estuarine production. *New York State Conservationist* June-July: 12-16.
- Odum, E. P. and A. A. de la Cruz. 1967. Particulate organic detritus in a Georgia salt marsh-estuarine ecosystem. pp. 383-388. In G. H. Lauff (ed.), *Estuaries*. American Association for Advancement of Science Publ. 83.
- Odum, E. P. and A. E. Smalley. 1959. Comparison of population energy flow of a herbivorous and a deposit-feeding invertebrate in a salt marsh ecosystem. *Proceedings of the National Academy of Science* 45: 617-622.
- Pendleton, E. C. 1979. Tidal import and export of organic detritus and organisms in a North Carolina salt marsh creek system. Ph.D. Thesis, North Carolina State Univ., Raleigh. 95 p.
- Peterson, B. J., R. W. Howarth, F. Lipschultz, and D. Ashendorf. 1980. Salt marsh detritus: an alternative interpretation of stable carbon isotope ratios and the fate of *Spartina alterniflora*. *Oikos* 34: 173-177.

- Pomeroy, L. R. 1959. Algal productivity in salt marshes of Georgia. *Limnology and Oceanography* 4: 386-397.
- Pomeroy, L. R., K. Bancroft, J. Breed, R. R. Christian, D. Frankenberg, J. R. Hall, L. G. Mauer, W. J. Wiebe, R. F. Wiegert, and R. L. Wetzel. 1977. Flux of organic matter through a salt marsh, pp. 270-297. *In* M. Wiley (ed.). *Estuarine Processes*, VII. Academic Press, New York.
- Redfield, A. C. 1972. Development of a New England salt marsh. *Ecological Monographs* 42: 201-237.
- Reimold, R. J., J. L. Gallagher, and D. E. Thompson. 1973. Remote sensing of tidal marsh. *Photogrammetry and Engineering* 39: 477-488.
- Richard, G. A. 1978. Seasonal and environmental variations in sediment accretion in a Long Island salt marsh. *Estuaries* 1: 29-35.
- Rogers, R. M., Jr. 1969. Marine meiobenthic organisms in a Louisiana marsh. M. S. Thesis, Louisiana State Univ., Baton Rouge. 83 p.
- Rublee, P. A. 1982. Seasonal distribution of bacteria in salt marsh sediments in North Carolina. *Est. Coast. Shelf Sci.* (In press).
- Sanders, H. L. 1956. *Oceanography of Long Island Sound*. X. The biology of marine bottom communities. *Bull. Bingham Oceanogr. Collect.* Yale Univ., New Haven, Conn. 15: 345-414.
- Schultz, D. M. and J. G. Quinn. 1973. Fatty acid composition of organic detritus from *Spartina alterniflora*. *Estuarine and Coastal Marine Science* 1: 177-180.
- Seneca, E. D., L. M. Stroud, U. Blum, and G. R. Noggle. 1976. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Walden Creek marshes, Brunswick County, North Carolina, 1975-1976. Third Annual Rept. to Carolina Power and Light Company, Raleigh, NC. 335 p.
- Settlemyre, J. L. and L. R. Gardner. 1975. A field study of chemical budgets for a small tidal creek—Charleston Harbor, S.C., pp. 152-175. *In* T. M. Church (ed.). *Marine Chemistry in the Coastal Environment*. ACS Symposium Series 18, American Chemical Society, Washington, D.C.
- Shanholtzer, S. F. 1973. Energy flow, food habits and population dynamics of *Uca pugnax* in a salt marsh system. Ph.D. Thesis, Univ. of Georgia, Athens. 91 p.
- Shirley, T. C., G. J. Denoux, and W. B. Stickle. 1978. Seasonal respiration in the marsh periwinkle, *Littorina irrorata*. *Biological Bulletin* 154: 322-334.
- Sikora, J. P., W. B. Sikora, C. W. Erkenbrecher, and B. C. Coull. 1977. Significance of ATP, carbon, and caloric content of meiobenthic nematodes in partitioning benthic biomass. *Marine Biology* 44: 7-14.
- Smalley, A. E. 1958. The role of two invertebrate populations, *Littorina irrorata* and *Orchelimum fidicinum*, in the energy flow of a salt marsh ecosystem. Ph.D. Thesis, Univ. of Georgia, Athens. 126 p.
- . 1960. Energy flow of a salt marsh grasshopper population. *Ecology* 41: 785-790.
- Stiven, A. E. and E. D. Kuenzler. 1979. The response of two salt marsh molluscs, *Littorina irrorata* and *Geukensia demissa*, to field manipulations of density and *Spartina* litter. *Ecol. Monographs* 49: 151-171.
- Stroud, L. M. and A. W. Cooper. 1968. Color-infrared aerial photographic interpretation and net primary productivity of a regularly-flooded North Carolina salt marsh. Water Resources Institute, Rept. No. 14. North Carolina State Univ., Raleigh. 86 p.
- Teal, J. M. 1958. Distribution of fiddler crabs in Georgia salt marshes. *Ecology* 39: 185-193.
- . 1962. Energy flow in the salt marsh ecosystem of Georgia. *Ecology* 43: 614-624.
- Teal, J. M. and J. W. Kanwisher. 1961. Gas exchange in a Georgia salt marsh. *Limnology and Oceanography* 6: 388-399.
- . 1966. Gas transport in the marsh grass, *Spartina alterniflora*. *J. of Exp. Botany* 17: 355-361.
- Teal, J. M. and W. Wieser. 1966. The distribution and ecology of nematodes in a Georgia salt marsh. *Limnology and Oceanography* 11: 217-222.
- Tietjen, J. H. and J. J. Lee. 1977. Feeding behavior of marine nematodes, pp. 21-35. *In* B. C. Coull (ed.). *Ecology of Marine Benthos*. Univ. of South Carolina Press, Columbia.
- Turner, R. E. 1978. Community plankton respiration in a salt marsh estuary and the importance of macrophytic leachates. *Limnology and Oceanography* 23: 442-451.
- Valiela, I., J. M. Teal, and N. Y. Persson. 1976. Production and dynamics of experimentally enriched salt marsh vegetation: Belowground biomass. *Limnology and Oceanography* 21: 245-252.

- Valiela, I., J. M. Teal, and W. J. Sass. 1975. Production and dynamics of salt marsh vegetation and the effects of experimental treatment with sewage sludge. *J. of Applied Ecology* 12: 973-981.
- Valiela, I., J. M. Teal, S. Volkmann, D. Shafter, and E. J. Carpenter. 1978. Nutrient and particulate fluxes in a salt marsh ecosystem: Tidal exchanges and inputs by precipitation and groundwater. *Limnology and Oceanography* 23: 798-812.
- Wieser, W. 1960. Benthic studies in Buzzards Bay. II. The meiofauna. *Limnology and Oceanography* 5: 121-137.
- Wieser, W. and J. W. Kanwisher. 1961. Ecology and physiological studies on marine nematodes from a small salt marsh near Woods Hole, Massachusetts. *Limnology and Oceanography* 6: 262-270.
- Woodwell, G. M., D. E. Whitney, C. A. S. Hall, and R. A. Houghton. 1977. The Flax Pond ecosystem study: Exchanges of carbon in water between a salt marsh and Long Island Sound. *Limnology and Oceanography* 22: 833-838.

APPENDIX

Section I. Calculation of Ecosystem Respiration and Primary Production

The data used to estimate ecosystem respiration and primary production in this paper were used previously by Blum *et al.* (1978). Since we wished to treat the data in a slightly different manner, we have presented the original data here (Appendix Table 1); these data were the basis of Table 7 in Blum *et al.* (1978).

Ecosystem Respiration

A major difficulty with the use of vegetable oil by Blum *et al.* (1978) to partition sediment respiration from aboveground respiration was the failure of the oil to completely seal the surface. Approximately $36 \pm 16\%$ of sediment respiration was estimated to escape through the oil seal; thus, aboveground ecosystem respiration was overestimated and sediment respiration was underestimated. We attempted to correct for this error as follows:

Let the quantities actually measured be total ecosystem respiration (R_{SE}) and aboveground respiration ($R_{S_{SC}}$); sediment respiration (R_{S_s}) was calculated as the difference between the two. Although the values for ecosystem respiration are correct, those for aboveground and sediment respiration differ from the true values ($R_{S_{SC}}^*$ and $R_{S_s}^*$) due to the inclusion of 36% of sediment respiration as aboveground respiration. Thus

$$1) R_{S_{SC}} = R_{S_{SC}}^* + 0.36R_{S_s}^*$$

and

$$2) R_{SE} = R_{S_{SC}}^* + R_{S_s}^*.$$

Therefore

$$3) R_{S_s}^* = (R_{SE} - R_{S_{SC}})/0.64$$

and

$$4) R_{S_{SC}}^* = R_{SE} - R_{S_s}^*.$$

Using Eqs. 3 and 4, we have recalculated the original data in Appendix Table 1 to estimate the true values for aboveground and sediment respiration given in Appendix Table 2. We treated light and dark periods separately and assumed that aboveground respiration in the light was negligible since *Spartina* is a C_4 plant (Black 1973). As an example, the calculations for Feb. 16 in the short *Spartina* area were:

$$\begin{aligned} \text{Light } R_{S_s}^* &= (0.69 - 0.33)/0.64 = 0.56 \\ R_{S_{SC}}^* &= 0.00 \text{ (by assumption)} \end{aligned}$$

$$\begin{aligned} \text{Dark } R_{S_s}^* &= (0.57 - 0.27)/0.64 = 0.47 \\ R_{S_{SC}}^* &= 0.57 - 0.47 = 0.10 \end{aligned}$$

$$\begin{aligned} \text{Total } R_{S_s}^* &= 0.56 + 0.47 = 1.03 \text{ g C m}^{-2} \text{ day}^{-1} \\ R_{S_{SC}}^* &= 0.00 + 0.10 = 0.10 \text{ g C m}^{-2} \text{ day}^{-1}. \end{aligned}$$

Primary Production

In order to estimate ecosystem gross production (GPP), it was necessary to correct the quantity actually measured, net ecosystem photosynthesis (NEP_s), for ecosystem respiration during the measurement. Since the measurements were carried out in the light, we assume there was no aboveground respiration. Therefore

$$5) GPP = NEP_s + Rs_{s*}^{(light)}$$

The calculated values of daily gross production are presented in Appendix Table 2. As an example, the calculation for Feb. 16 in the short *Spartina* area was:

$$GPP = 0.80 + 0.56 = 1.36 \text{ g C m}^{-2} \text{ day}^{-1}.$$

Seasonal and Annual Totals

The daily values of gross production and aboveground and sediment respiration were multiplied by the appropriate number of days in the season [winter (Feb. 16), 90; spring (Apr. 19), 92; summer (Jul. 18), 94; and fall (Nov. 3), 89] to give seasonal totals (Appendix Table 3). These seasonal totals were summed to give annual totals which were then converted from g C to kcal by multiplying by the appropriate conversion factor (short, 9.44; medium, 8.52; and tall, 8.98; calculated from factors given in Blum *et al.* 1978, for converting g C to g dry weight and g dry weight to kcal).

Section II. Calculation of Belowground *Spartina* Respiration

Although it was possible to partition aboveground *Spartina* respiration from total aboveground respiration by subtracting the estimated contribution of aboveground fauna (Table 2), a corresponding treatment of the sediment respiration data in order to estimate belowground *Spartina* respiration was not possible because we had no independent figures for sediment faunal and microbial respiration. Therefore, we attempted to estimate belowground *Spartina* respiration from aboveground respiration.

Aboveground respiration in the dark accounted for 59% of the total respiration of short *Spartina* in a Georgia marsh (Teal and Kanwisher 1961, 1966); in the light aboveground respiration is assumed to be negligible in *Spartina* since it is a C_4 plant (Black 1973), but belowground respiration should proceed at the same rate in the light and in the dark (assuming other extrinsic variables such as temperature are unchanged). If we let Rs_{ABOVE} be the total aboveground respiration during the average 12-hour dark period and Rs_{BELOW} be the total belowground respiration during the same period, then respiration during the dark (Rs_{DARK}) will be

$$6) Rs_{DARK} = Rs_{ABOVE} + Rs_{BELOW}$$

Respiration during the light period will be belowground only and the belowground rate will be the same as during the dark, so

$$7) Rs_{LIGHT} = Rs_{BELOW}$$

For the entire day, respiration (Rs_{TOT}) will be

$$8) Rs_{TOT} = Rs_{DARK} + Rs_{LIGHT} = Rs_{ABOVE} + 2 \cdot Rs_{BELOW}$$

From Teal and Kanwisher's experiments and Eq. 6:

$$9) Rs_{ABOVE}/Rs_{DARK} = Rs_{ABOVE}/(Rs_{ABOVE} + Rs_{BELOW}) = 0.59$$

Combining Eq. 8 and 9 we can determine the fraction aboveground respiration makes up of the entire daily respiration:

$$10) Rs_{ABOVE}/(Rs_{ABOVE} + 2Rs_{BELOW}) = 0.42.$$

In Walden Creek the aboveground portion of short *Spartina* accounted for 27% of the total biomass (Seneca *et al.* 1976). If we assume the biomass ratio was similar in Georgia, then the aboveground portion of the short *Spartina* accounted for 42% of the daily respiration while making up only 27% of the biomass; similarly, the belowground portion accounted for 58% of the respiration and 73% of the biomass. We can compare the relative rate of respiration of the aboveground to belowground *Spartina* by comparing the respiration:biomass (R:B) ratios. For the aboveground portion, R:B is 42:27 or 1.56:1; for the belowground portion, R:B is 58:73 or 0.79:1. Assuming that these same R:B ratios hold for medium and tall *Spartina* tissue as well, we can calculate the distribution of respiration

between aboveground and belowground portions simply by knowing the distribution of biomass. In medium *Spartina* areas in Walden Creek, aboveground biomass accounts for 49% of the total and belowground for 51%. The portion of respiration accounted for by the aboveground portion will be

$$(1.56 \cdot 0.49)/(1.56 \cdot 0.49 + 0.79 \cdot 0.51) = 0.65.$$

Similarly, for tall *Spartina*, where aboveground biomass is 77% of the total, aboveground respiration will account for

$$(1.56 \cdot 0.66)/(1.56 \cdot 0.77 + 0.79 \cdot 0.23) = 0.87$$

of the total. For the three height-forms of *Spartina*, then, the portion of total respiration accounted for by the aboveground portion of the plants is: short, 42%; medium, 65%; and tall, 87%. The ratio of aboveground to belowground respiration for the three height-forms is: short, 0.72:1; medium, 1.87:1; and tall, 6.53:1.

Appendix Table 1. Calculated carbon exchange data for net ecosystem photosynthesis (NEP_s), ecosystem respiration (Rs_E) during light and dark periods, and aboveground respiration (Rs_{sc}) during light and dark periods in $g\ C\ m^{-2}\ day^{-1}$ for Walden Creek marsh. These data were used to construct Table 7 in Blum *et al.* (1978).

Date	<i>Spartina</i> type	NEP_s	Rs_E		Rs_{sc}	
			Light	Dark	Light	Dark
Feb 16	Short	0.80	0.69	0.57	0.33	0.27
Apr 19	Short	2.50	0.73	0.17	0.35	0.07
Jul 18	Short	0.19	2.36	1.62	1.56	0.94
Nov 3	Short	1.33	0.94	0.09	0.42	0.00
Feb 16	Medium	1.85	1.26	1.24	0.88	0.91
Apr 19	Medium	3.81	1.89	0.97	1.26	0.78
Jul 18	Medium	2.42	3.85	2.88	2.81	2.00
Nov 3	Medium	2.73	1.79	1.01	1.09	0.65
Feb 16	Tall	2.60	2.17	2.31	1.69	1.86
Apr 19	Tall	4.36	2.35	1.36	1.37	0.88
Jul 18	Tall	3.56	4.82	3.70	3.45	2.55
Nov 3	Tall	3.43	2.19	1.49	1.75	1.43

Appendix Table 2. Calculated carbon exchange data for aboveground (Rs_{sc}^*) and aboveground (Rs_s^*) respiration during light and dark periods and gross primary production (GPP) in $g\ C\ m^{-2}\ day^{-1}$ for Walden Creek marsh.

Date	<i>Spartina</i> type	Light		Dark		Total		GPP
		Rs_{sc}^*	Rs_s^*	Rs_{sc}^*	Rs_s^*	Rs_{sc}^*	Rs_s^*	
Feb 16	Short	0.00	0.56	0.10	0.47	0.10	1.03	1.36
Apr 19	Short	0.00	0.59	0.01	0.16	0.01	0.75	3.09
Jul 18	Short	0.00	1.25	0.56	1.06	0.56	2.31	1.44
Nov 3	Short	0.00	0.81	0.00	0.09	0.00	0.90	2.14
Feb 16	Medium	0.00	0.59	0.72	0.52	0.72	1.11	2.44
Apr 19	Medium	0.00	0.98	0.67	0.30	0.67	1.28	4.79
Jul 18	Medium	0.00	1.63	1.50	1.38	1.50	3.01	4.05
Nov 3	Medium	0.00	1.09	0.45	0.56	0.45	1.65	3.82
Feb 16	Tall	0.00	0.75	1.61	0.70	1.61	1.45	3.35
Apr 19	Tall	0.00	1.53	0.61	0.75	0.61	2.28	5.89
Jul 18	Tall	0.00	2.14	1.90	1.80	1.90	3.94	5.70
Nov 3	Tall	0.00	0.69	1.40	0.09	1.40	0.78	4.12

Appendix Table 3. Annual and seasonal totals for gross primary production (GPP), aboveground (R_{SG}^*), and belowground (R_{Sg}^*) respiration calculated from daily values (Table 2) assuming winter, spring, summer, and fall have 90, 92, 94, and 89 days, respectively. Conversion factors for kcal per g C for the three marsh areas were: short: 9.44; medium, 8.52; and tall, 8.98. Overall totals take into account the extent of each height-form in Walden Creek marsh.

Season	<i>Spartina</i> type	GPP	R_{SG}^*	R_{Sg}^*
Winter (Feb 16)	Short	122.4	9.0	92.7
Spring (Apr 19)	Short	284.3	0.9	69.0
Summer (Jul 18)	Short	135.4	52.6	217.1
Fall (Nov 3)	Short	190.5	0.0	80.1
Total (g C m ⁻²)	Short	732.6	62.5	458.9
Total (kcal m ⁻²)	Short	6916	590	4332
Winter (Feb 16)	Medium	219.6	64.8	99.9
Spring (Apr 19)	Medium	440.7	61.6	117.8
Summer (Jul 18)	Medium	380.7	141.0	282.9
Fall (Nov 3)	Medium	340.0	40.1	146.9
Total (g C m ⁻²)	Medium	1381.0	307.5	647.5
Total (kcal m ⁻²)	Medium	11,766	2620	5517
Winter (Feb 16)	Tall	301.5	1414.9	130.5
Spring (Apr 19)	Tall	541.9	56.1	209.8
Summer (Jul 18)	Tall	535.8	178.6	370.4
Fall (Nov 3)	Tall	366.7	124.6	69.4
Total (g C m ⁻²)	Tall	1745.9	504.2	780.1
Total (kcal m ⁻²)	Tall	15,678	4528	7005
Overall total (kcal m ⁻²)		11,386	2509	5519

Featured Research Program

Quaternary Paleoecology of the Southeastern United States

by

Paul A. Delcourt and Hazel R. Delcourt

*Program for Quaternary Studies of the Southeastern United States
University of Tennessee, Knoxville*

The history of vegetational and climatic change in the Southeast has been a topic of great interest to biogeographers for many decades (Cain 1943; Deevey 1949; Sharp 1951; Braun 1950, 1955; Watts 1970; Holt 1971; Whitehead 1973; Delcourt and Delcourt 1979, 1981). Braun (1950) proposed that no appreciable vegetational or climatic changes occurred south of the glacial margin during full-glacial times. In contrast, Deevey (1949) and Maxwell and Davis (1972) envisioned wholesale migrations of taxa southward during the full glacial beyond their present southernmost range limits. Our research initially centered upon testing these contrasting hypotheses by documenting the extent of biotic response to climatic change over a glacial/interglacial time scale, particularly the past 40,000 years, in the region west and south of the southern Appalachian Mountains (Delcourt and Delcourt 1977; H. Delcourt 1979; P. Delcourt 1980; P. Delcourt *et al.* 1980). Of special interest to us has been locating the full-glacial refuge areas for deciduous forest species that subsequently repopulated much of the area in eastern North America. We first approached this question by focusing upon the modern distributions of plant species characteristic of cool-temperate mesic forests. These plant species are today distributed within the central and southern Appalachians and extend southward onto the Gulf Coastal Plain only within restricted Bluffland habitats. These Bluffland habitats are cool moist ravines with fertile silt-loam soils located along river bluffs of the Mississippi, Apalachicola, and other major river systems in the Southeast (Delcourt and Delcourt 1975). Modern species distributions illustrate habitat continuity along the Blufflands adjacent to these drainageways and may be interpreted as evidence that these taxa have persisted in the Blufflands habitats continuously since the last full-glacial period. Such conclusions based upon modern distributions alone, however suggestive, remain highly speculative.

Plant assemblages preserved as fossils within sedimentary sequences provide information crucial for determining changes in species ranges as they have shifted geographically through time. Documentation of the distributional history of individual taxa as well as biotic assemblages requires locating fossil sites with

anaerobic conditions that permit preservation of assemblages of pollen, fruits, seeds, and other macroscopic plant fragments within sediments that have accumulated continuously over long periods of time. Previous investigators stressed the paucity of suitable lake and bog environments in the Southeast for paleoecological research (Watts 1970; Whitehead 1973). Two regions provide abundant Quaternary sites: the "Carolina Bay" lakes and pocosins of the Outer Coastal Plain of North and South Carolina (Buell 1945; Frey 1953; Whitehead 1973, 1981) and the lake district of Florida (Watts 1975; Watts and Stuiver 1980). For the remainder of the Southeast, a strategy is needed to discover new sites with significant paleoecological records. Through a combination of detailed examination of geologic maps, topographic maps, and advice from local residents and conservation organizations, we have located major plant-fossil sequences preserved in stream terraces, sinkholes, sag ponds, woodland-hollow pools, and sphagnum bogs. The number and variety of potential sites for paleoecological studies is much wider than previously recognized, and will provide the material for substantial new discoveries for many years to come.

We have recently summarized available paleoecological data from eastern North America for the past 40,000 years, mapping not only full-glacial refuge areas but also changes in the distribution and areal extent of plant formations and large vegetation types (Delcourt and Delcourt 1981). We now have a framework for vegetational change that indicates that although substantial change has occurred, most of the taxa now characteristic of eastern North America were probably able to persist in the Southeast throughout the late Quaternary. Community composition has changed as climatic zones have shifted and species migrated; however, most vegetational types have maintained their temporal and spatial continuity over this time span.

With a growing need for conserving representative ecosystems as well as rare elements of the native flora and fauna of the Southeast (White and Bratton 1980), there is also a need for integrating ecologic and paleoecologic data and perspectives. Fossil pollen and plant macrofossils can yield data that not only show us the locations of past refuges, but that also indicate the patterns and processes of vegetational change over a spectrum of spatial and temporal scales in response to a variety of environmental disturbance regimes. We are now addressing important ecological questions with empirical data not obtainable by sampling only the modern vegetation. We can determine the rates and direction of compositional change in the vegetation in specific ecological regions under given climatic changes. This information provides a paleoecological perspective with which, for example, to anticipate the magnitude of vegetational response to anthropogenic modification of climate with increasing CO₂ concentrations in the atmosphere (H. Delcourt 1981). Using paleoecological data, we can map the changes in areal extent of ecosystem types through analogous periods of climatic warming such as the mid-postglacial within ecologically sensitive and important areas such as the Great Smoky Mountains National Park Biosphere Reserve and surrounding Blue Ridge Mountains. Bog environments suitable for pollen and plant-macrofossil analysis often coincide with habitats considered for preservation because of their unusual modern fauna and flora (Pitillo and Smathers 1979), making it doubly important to determine their origin and the conditions necessary for their perpetuation. Such information is important for establishing management policies for nature preserves and national parks in the mountains as well as on the coastal plain.

Through a combination of geomorphological, archaeological, and paleoecological techniques, we can gain insight into the effects of both Indians and Europeans on the environment. In East Tennessee, man-land interactions over the past 10,000 years prior to European settlement involving the progressive expansion of cultivation and fragmentation of bottomland forests have been demonstrated along the Little Tennessee River. Man's long-term impact upon native ecosystems in the Southeast is in the formative stages of understanding.

At the Program for Quaternary Studies at the University of Tennessee, we are currently developing a comprehensive computerized data base of both modern and fossil pollen information, along with continuous forest inventories derived from Forest Service reports and climatic data for a corresponding geographic array of weather stations. Through our NSF-funded project FORMAP (Forest Mapping across Eastern North America from 20,000 yr BP to the Present), we (in collaboration with T. Webb III of Brown University) are preparing an atlas of contour maps of corresponding distributions of forest tree dominance and arboreal pollen percentages across eastern North America. Regression analysis will establish the quantitative relationships of pollen and forest-inventory data as well as of pollen and climatic variables with which we will be able to interpret past vegetation and climate more precisely. These tools supplement our extensive taxonomic modern and fossil reference collections for pollen (1500 slides) and plant macrofossils (3000 samples from vouchered herbarium specimens), field, laboratory, and microscope equipment for obtaining and processing sediment cores. The collections and equipment, as well as lab and office facilities for accomplishment of these research objectives, are housed within the Departments of Geological Sciences and Botany and the Graduate Program of Ecology. At the University of Tennessee, current projects of Quaternary research involve faculty and graduate students in Geological Sciences, Botany, Ecology, Zoology, Anthropology and Archaeology, Geography, and Soil Science. Regional paleoecological and paleoenvironmental projects involve collaboration with researchers at Western Carolina University, Tennessee Technological University, Brown University, the National Park Service, Tennessee Valley Authority, and the U.S. Army Corps of Engineers.

SUMMARY INFORMATION
RESEARCH IN PALEOECOLOGY, PROGRAM FOR
QUATERNARY STUDIES
THE UNIVERSITY OF TENNESSEE, KNOXVILLE

PERSONNEL:

PRINCIPAL INVESTIGATORS

Dr. Paul A. Delcourt, Assistant Professor
Department of Geological Sciences and Graduate Program in Ecology

Dr. Hazel R. Delcourt, Research Associate
Department of Botany

GRADUATE STUDENT RESEARCH

Patricia A. Cridlebaugh, Department of Anthropology and Archaeology
(Man-Land Interaction and Paleoenvironmental History of the Lower Little
Tennessee River Valley)

Jean L. Davidson, Graduate Program in Ecology
(Quaternary Paleoecology of Lake in the Woods, Cades Cove, Great Smoky
Mountains National Park)

Allen Torbett, Department of Geological Sciences
(Periglacial Geomorphology in the Great Smoky Mountains of East Tennessee)

Gary R. Wilkins, Department of Anthropology and Archaeology
(Quaternary Paleoecology of Central Kentucky)

LITERATURE CITED

- Braun, E. L. 1950 (Reprinted 1974). Deciduous forests of eastern North America. Hafner Press, Macmillan Publ. Co., Inc., New York. 596 pp.
- . 1955. The phytogeography of unglaciated eastern United States and its interpretation. *Bot. Rev.* 21: 297–375.
- Buell, M. F. 1945. Late Pleistocene forests of southeastern North Carolina. *Torrey* 45: 117–118.
- Cain, S. A. 1943. The Tertiary character of the cove hardwood forests of the Great Smoky Mountains National Park. *Bull. Torrey Bot. Club* 70: 213–235.
- Deevey, E. S. 1949. Biogeography of the Pleistocene. *Geol. Soc. Amer. Bull.* 60: 1315–1416.
- Delcourt, H. R. 1979. Late Quaternary vegetation history of the Eastern Highland Rim and adjacent Cumberland Plateau of Tennessee. *Ecological Monographs* 49(3): 255–280.
- . 1981. The virtue of forests, virgin and otherwise. *Natural History Magazine* 90(6): 32–39.
- Delcourt, H. R. and P. A. Delcourt. 1975. The Blufflands: Pleistocene pathway into the Tunica Hills. *Am. Midl. Nat.* 94: 385–400.
- Delcourt, P. A. 1980. Goshen Springs: Late Quaternary vegetation record for southern Alabama. *Ecology* 61(2): 371–386.
- Delcourt, P. A. and H. R. Delcourt. 1977. The Tunica Hills, Louisiana-Mississippi: Late glacial locality for spruce and deciduous forest species. *Quaternary Research* 7(2): 218–237.
- . 1979. Late Pleistocene and Holocene distributional history of the Deciduous Forest in the Southeastern United States. *Veröffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rübel (Zürich)* 68: 79–107.
- . 1981. Vegetation maps for Eastern North America: 40,000 yr BP to the present, pp. 123–166. *In* Romans, R. C. (Ed.), *Geobotany II*, Plenum Press, New York.
- Delcourt, P. A., H. R. Delcourt, R. C. Brister, and L. E. Lackey. 1980. Quaternary vegetation history of the Mississippi Embayment. *Quaternary Research* 13(1): 111–132.
- Frey, D. G. 1953. Regional aspects of the late-glacial and postglacial pollen succession of south-eastern North Carolina. *Ecological Monographs* 23: 298–313.
- Holt, P. C. (Ed.). 1971. The distributional history of the biota of the Southern Appalachians. Part II. Flora. Virginia Polytechnic Institute, Blacksburg, Virginia, Research Division Monograph 2.
- Maxwell, J. A. and M. B. Davis. 1972. Pollen evidence of Pleistocene and Holocene vegetation on the Allegheny Plateau, Maryland. *Quaternary Research* 2(4): 506–530.
- Pittillo, J. D. and G. A. Smathers. 1979. Phytogeography of the Balsam Mountains and Pisgah Ridge, Southern Appalachian Mountains. *Veröffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rübel (Zürich)* 68: 206–245.
- Sharp, A. J. 1951. The relation of the Eocene Wilcox flora to some modern floras. *Evolution* 5: 1–5.
- Watts, W. A. 1970. The full-glacial vegetation of northwestern Georgia. *Ecology* 51(1): 17–33.
- . 1975. A Late Quaternary record of vegetation from Lake Annie, south-central Florida. *Geology* 3:344–346.
- Watts, W. A. and M. Stuiver. 1980. Late Wisconsin climate of Northern Florida and the origin of species-rich deciduous forest. *Science* 210: 325–327.
- White, P. A. and S. P. Bratton. 1980. After preservation: Philosophical and practical problems of change. *Biological Conservation* 18: 241–255.
- Whitehead, D. R. 1973. Late-Wisconsin vegetational changes in unglaciated eastern North America. *Quaternary Research* 3: 621–631.
- . 1981. Late-Pleistocene vegetational changes in northeastern North Carolina. *Ecological Monographs* 51(4): 451–471.

At the Richmond Meeting

1982 MERITORIOUS TEACHING AWARD



Dr. Fred H. Norris

The recipient of the Association's Meritorious Teaching Award was Fred H. Norris, long-time professor of botany at the University of Tennessee in Knoxville. The award was presented at the annual banquet by Bill Martin, a former student of Professor Norris. The award includes a certificate, a bronze medallion, and a check for \$1000, sponsored by Carolina Biological Supply Company. Professor Norris will also receive a bound volume of letters of support from associates and friends.

Professor Norris was educated at Otterbein College, Westerville, Ohio, with a B.S. degree in biology in 1934, and at Ohio State University with a master's degree in 1937 and a Ph.D. degree in 1948 in botany. His research emphasis was in the area of plant ecology.

Dr. Norris' teaching career began as a graduate teaching assistant in botany at Ohio State in 1935. In 1947 he joined the faculty at the University of Tennessee as an instructor, and thirty-three years later, in 1980, Fred Norris became Professor Emeritus. He continues to teach at Urbana College in Urbana, Ohio. Over this span of years, Fred Norris won the respect and admiration of colleagues, students, and numerous TA's. Letters from all parts of the country were received in testimony to Professor Norris' contributions to the teaching of botany.

RESEARCH AWARDS

The **1982 ASB Research Award**, sponsored by **Beckman Instruments, Inc.**, was presented to *Drs. Jon M. Stucky* and *Robert L. Beckmann*, both Associate Professors of Botany, N. C. State University, Raleigh. Their award-winning paper was **Pollination Biology, Self-Incompatibility, and Sterility in *Ipomoea pandurata* (L.) G. F. W. Meyer (Convolvulaceae)** with the following abstract.

Ipomoea pandurata rarely produces seed. Sporophytic self-incompatibility is a secondary factor contributing to the reduced seed production because the principal pollinators, *Bombus pennsylvanicus* (Apidae) and *Melitoma taurea* (Anthophoridae), effect cross-pollination in most populations. Sterility, expressed as pollen tube failure in the style and as a sterility mechanism in the ovary, is the primary factor accounting for reduced seed production. It is difficult to reconcile the extensive geographical distribution of *I. pandurata* with this sterility.

The **1982 Student Research Award**, sponsored by **Martin Instrument Company**, was won by *Mr. Lawrence J. Davenport*. Mr. Davenport is originally from Seattle, Washington, and earned his B.A. in Botany from Miami University and his M.S. in Biology at the University of Alabama. He is currently enrolled in a doctoral program at the University of Alabama. His award-winning paper was **Seed Morphology in *Hydrolea* (Hydrophyllaceae) and Its Taxonomic Significance** with the following abstract.

Seeds of *Hydrolea* species were examined under scanning electron microscopy. These seeds are ovate to cylindrical in shape, 0.3–0.7 mm long, 0.2–0.3 mm wide, with distinct longitudinal and (more rarely) lateral ridges. Testae are marked by prominent reticulation patterns, with the reticulations either broad and molded into the seed coat, narrow and lacking ornamentation at the reticulation joints, narrow with papillae at the reticulation joints, or still more narrow with circles or “doughnuts” at the joints. These reticulation patterns blend from one into another, with no clear dividing lines between seed types. This knowledge of *Hydrolea* seed morphology can be utilized at three taxonomic levels—the generic, subgeneric, and specific. At the generic level, seed coat morphology adds further evidence for the distinctness of *Hydrolea* and its close relative, *Nama*, as the seeds of *Nama* are characterized by pitting and thickening patterns rather than by reticulations. At the subgeneric level, the lack of clear distinctions between seed types indicates that seed morphology can be used to neither support nor refute the validity of the established sections of the genus; other characters must be utilized in examining these sections. At the specific level, the study of seed morphology facilitates the satisfactory classification of an historically confusing taxon, *Sagonca palustris*, and points to necessary changes in nomenclature.

ASB CONSERVATION COMMITTEE RESOLUTION

The following resolution was presented to the members of the Association of Southeastern Biologists at the 43rd annual business meeting by the ASB Conservation Committee. This resolution was unanimously adopted by those present and voting:

WHEREAS the Association of Southeastern Biologists is comprised of professional biologists who engage in research and teaching of life sciences from cells to ecosystems and;

WHEREAS the members recognize the value of and the necessity for maintaining a clean and healthy environment, including conservation of all forms of life and their environments and;

WHEREAS the Endangered Species Act and the Clean Air Act are up for reauthorization, and the provisions of these Acts are of great concern to the members of the Association and;

WHEREAS current policy decisions by federal agencies such as the Department of the Interior, Department of Agriculture, and the Environmental Protection Agency could result in serious degradation of environmental quality and the loss or degradation of unique species and/or ecosystems;

BE IT THEREFORE RESOLVED THAT:

(1) The Association supports a Department of Interior that recognizes its long-range responsibility as the principal *steward* of millions of acres of federal lands. We believe that the following policies promoted by the Secretary of Interior, Mr. James Watt, are contrary to the intent of Congress and contrary to the Department's long-term stewardship role:

(a) the proposal that funds from the Land and Water Conservation Fund be used for management purposes rather than land acquisition as mandated by law;

(b) attempts to open designated wilderness areas to mineral exploration;

(c) the policy decision to concentrate future endangered species efforts on the recovery of listed species and the concomitant decision to restrict the listing of additional species; and

(d) the promotion of commercialization in some of the nation's unique national ecosystems, our National Parks;

(e) promotion of the use of a very toxic, non-selective poison for predator control on Federal rangelands; the poison has been banned by the three previous Administrations.

(2) In particular, the Association supports reauthorization of a strong Endangered Species Act (ESA), including the following key provisions:

(a) protection afforded by the ESA should continue to be available to all endangered or threatened animals or plants; we feel that it is not possible to make an *a priori* determination as to the value of a species;

(b) listing a species as threatened or endangered should be based solely on the biological status of the species. Economic considerations only should be considered in determining how to protect a species that already has been listed;

(c) designation of critical habitat, unless such a designation is not considered prudent, should continue to be part of the listing process. Designation of critical habitat alerts federal and state agencies, local governments, landowners, and others that the area is important to conserving the species;

(d) the requirement that federal agencies must ensure that their actions do not jeopardize the continued existence of a listed species or its function without unduly interfering with economic development;

(e) the ESA should continue to provide for cost sharing grants to state wildlife agencies for work on endangered or threatened species. A cooperative state-federal effort is essential to the implementation of a successful endangered species program; and

(f) the ESA should continue to provide for international cooperation and support in the conservation of endangered or threatened species.

(3) The Association supports a strong, well-funded, well-staffed Environmental Protection Agency. The EPA is responsible for carrying out the intent of the Clean Air Act, Clear Water Act, Toxic Substances Control Act, and other **Congressional Acts** designed to protect the air we breathe, the water we drink, and the land on which we live. Current policy decisions on the part of EPA officials, under the guise of fiscal constraint, threaten to destroy the effectiveness of the Agency. Reductions in agency funding, personnel, research monitoring and enforcement programs, make it impossible for the EPA to carry out its Congressional mandate. We believe that the Administrator of EPA, Ms. Anne Gorsuch, through current policy decision, is circumventing the intent of the Congress.

(4) The Association supports the reauthorization of a strong Clean Air Act, with

(a) the procedures, health standards, and enforcement provisions of the Act as amended in 1977 maintained or strengthened. The slow but steady progress that has been made to date in cleaning the air or keeping air clean is indicative of the need for more, not less, vigilance in the future. The Association is opposed to any efforts to weaken the present Clean Air Act;

(b) regulatory amendments to deal with the problem of acid rain. Present Environmental Protection Agency (EPA) standards apply only to acid rain-causing pollutants from new power plants; most existing plants are uncontrolled. It is well-documented that acid rain threatens to destroy many of our streams and lakes, causes material damage to homes, cars, and historic statues and buildings, and reduces productivity of agricultural lands and forests. The unwillingness of the United States Government to address the problem of acid rain is also eroding our friendly relations with Canada;

(c) regulatory amendments to improve control of toxic air pollutants and solid wastes that cause cancer and other disabling diseases. The EPA has written hazard pollutant standards for only a few toxic pollutants. Many of the thousands of known pollutants are now considered potentially dangerous to human health and plant and animal life.

(5) The Association supports the multiple use concept of the U.S. Forest Service. However, recent proposals to increase timber sales and a recent reluctance to designate recognized, qualified wilderness

are neither in keeping with the multiple use concept nor are they economically or ecologically sound positions.

BE IT FURTHER RESOLVED that the Association urges the United States Congress to exercise its oversight function and its legislative powers to insure that this administration and its program administrators of natural resources agencies do not circumvent the intent of Congressional legislation through policy decision. Continuing the current proposals regarding stewardship of our natural resources are, in the professional opinion of Association members, short-sighted policies regarding these non-renewable resources.

BE IT FURTHER RESOLVED that the Association urges the Reagan Administration and the members of the Congress to exercise wisely their separate stewardship roles over our environmental resources by careful consideration of the long-term fiscal policy. **All association members are urged to contact their representatives and senators to express their personal concern and those of this Association.**

ASB Conservation Committee
William H. Martin, Chairman
Douglas A. Rayner

1982 COMMERCIAL EXHIBITORS

Carolina Biological Supply Co., Burlington, North Carolina (**Patron**)
Martin Instrument Co., Greenville, South Carolina (**Patron**)
Parco Scientific Co., Vienna, Ohio (**Patron**)
R. L. Dotts Instrument Co., Clinton, Tennessee
Worth Publishers, Inc., New York, New York
Nova Scientific Corporation, Burlington, North Carolina
Hunter Publishing Co., Winston-Salem, North Carolina
Preiser Scientific, Inc., Louisville, Kentucky
Sybron Lab Products, Rochester, New York
Ben Meadows Company, Atlanta, Georgia
Olympus Corporation of America, New Hyde Park, New York
Tekmar, Cincinnati, Ohio
American Optical, Tucker, Georgia

EMERITUS MEMBERS

A member of the ASB for ten or more years and who has retired from professional duties is eligible for election to Emeritus Membership. Those wishing such designation should make this request to the Treasurer. The following were elected at the 43rd Annual Meeting:

Walter S. Flory, Wake Forest University
Harry G. M. Jopson, Bridgewater College

NECROLOGY

During the past year, the Association lost by death the following members:

Joseph E. Adams, Chapel Hill, NC
Donald A. Olewine, Statesboro, GA
Tully S. Pennington, Statesboro, GA
Samuel R. Tipton, Southport, NC
Helen L. Ward, Lafayette, IN

I. SAVINGS ACCOUNTS

A. Peoples Bank of Tuscaloosa

Balance Jan. 1, 1981	\$ 7,907.21	
Interest	74.27	\$ 7,981.48
From savings to checking		7,981.48
Balance in Peoples Bank Savings Acct.		\$ -0-

B. Merrill-Lynch Ready Assets Trust

From checking to savings (net)	\$ 5,000.00	
Interest	551.91	5,551.91
Balance in Savings		\$ 5,551.91

II. CHECKING ACCOUNT

Balance on Hand Jan. 1, 1981	\$ 2,102.44
------------------------------	-------------

A. Receipts

Regular Dues/Subscriptions	8,267.00	
Patron Memberships	300.00	
Institutional Memberships	100.00	
Annual Meeting, Knoxville	3,063.92	
Honorarium Reimbursement (BSA)	250.00	
From Savings (Net 1981)	2,981.48	
Abstract Forms	60.00	
Royalty	6.45	
Reimb. for Publ. Article	130.83	
TOTAL RECEIPTS		15,159.68
TOTAL RECEIPTS & BEGINNING BALANCE		\$ 17,262.12

B. Disbursements

Membership & Publishing		
Roll Maintenance/Mailing/		
Circulation Manager	\$ 1,412.69	
ASB Bulletin (Vol. 28)	9,953.66	
Reimbursement for Subscription		
Cancellations	18.50	
Printing ASB Brochures	146.70	11,531.55

Office Expenses

Treasurer (Postage, etc.)	256.22	
Editor (Postage, Xerox)	48.87	
Secretary	22.34	
Membership Drive	115.30	
Newsletter	44.37	487.10

Travel and Related Expenses

Student Travel Awards	1,456.90	
October Exec. Comm.	1,584.89	
Editor (Allen Press)	427.23	
April Speaker Honorarium	500.00	3,969.02

Research Award

500.00

TOTAL DISBURSEMENTS

- 16,487.67

** BALANCE IN CHECKING Dec. 31, 1981

774.45

TOTAL ASSETS Dec. 31, 1981

\$ 6,326.36

Submitted by J. C. O'Kelley, Treas. Approved by Auditing Committee

Association Affairs

A VIEW FROM HERE

The ASB year begins and comes full cycle with the Annual Meeting. New officers begin their terms and those who have served may take a well-deserved vacation—not a retirement, since the Association usually calls upon them again. This year the vacationer is Dr. Carol Caudle Baskin who has just finished her three-year term as Secretary.

The 1982 meeting at Eastern Kentucky University was an excellent one, thanks to the Local Arrangements Committee and all those who arranged symposia, chaired paper sessions, presented papers, and attended the meeting. Dr. Cairns masterfully presented the emerging concepts and problems of monitoring and setting standards for the biological as well as the physiochemical components of stressed ecosystems.

Member involvement reaches a peak at the annual meetings. However, many members serve on committees throughout the year, and some are active communicators. More members should become active—reacting, suggesting, and recruiting new members. Several suggestions have been implemented recently and will be mentioned in this report. Members are welcome at executive committee meetings.

The 1983 Local Arrangements Committee for the meeting at the University of Southwestern Louisiana will welcome suggestions, too, for symposia, field trips, special sections of the program highlighting particular biological disciplines.

The suggestion has been made that workshops might add to the annual meeting program. Topics suggested have been teaching with materials found in the Southeast, and methods of geographic research, such as distributional studies centering on the Gulf of Mexico.

Other annual meeting suggestions have centered around the use of time, particularly Thursday evening and the mealtimes. The evening might be developed for affiliate society activities, biologically interesting films, and perhaps a slide exchange. The suggestion was that special meals be spread out so that people could attend without conflicts.

At the second executive committee meeting at the annual meeting it was decided to try a late summer trip by a small group of officers to the University of Southwestern Louisiana instead of the traditional full committee meeting in October in Atlanta. The decision was made because of travel costs and the realization that most of the October meeting has been devoted to local arrangements. Historically, the place-of-meeting committee chairman or a delegate visited a prospective institution before the decision was made to approve an Association meeting there. The visit this year will be at a time when the program is being developed, the local facilities scheduled, and field trips planned. The costs should be less, although there will be increased postal and telephone expenses to deal

with other important Association business. This change was suggested by a member.

Between annual meetings the activity centers in the Association committees. Some highlights should be mentioned.

The Travel Committee will have funds to help graduate students attend the 1983 meeting.

The Conservation Committee will disseminate the resolution passed at the 1982 annual business meeting (printed in this Bulletin) to appropriate leaders, particularly the U.S. Congress, and will start to work on other current environmental concerns. One of these is continuing conservation education. Dr. Lafayette Frederick of Howard University, the ASB representative to the AAAS, has consented to also serve as chairman of the Priorities in Public Affairs Committee, which works closely with the Conservation Committee.

The Meritorious Teaching Award Committee last year received several nominations. This year will be one of both soliciting nominations and development of the reference portfolios. Members have important roles in both of these activities.

The Place-Of-Meeting Committee will be working with Middle Tennessee State University to further plans for the 1985 meeting there. This meeting was approved at the 1982 annual business meeting by the members present. Also preliminary invitations for the 1986 meeting will be received and investigated. This is another place in the ASB activities where member input is important. This committee will also be involved this year in the special plans for the anniversary meeting at the University of Georgia in 1987.

The Research Award Committee should now be called 'Awards' because there are now two of them: this year for the first time an ASB Award for faculty research and a Student Award. The Committee has been doubled in size and co-chairmen have been designated.

The Membership Committee will be busy making a special canvas for members in the institutions near Lafayette. This is a way to encourage membership from smaller colleges as well as in larger colleges and universities. Also there will be a blanket mailing in the whole ASB region. This is not done every year, but there is a new brochure to be distributed. If you receive a mailing, please disseminate these membership pamphlets and talk to your colleagues about membership. Additional brochures may be obtained from the Treasurer.

The Editor has been busy developing a more varied Bulletin content of regional information, association news, featured research programs, special papers given at the annual meetings, and the Walton Distinguished Lecture of the Mountain Lake Biological Station. In this issue you will notice a new departure with the publication of a research review article. The Editor will receive similar articles which will make the Bulletin more valuable to libraries and to members. Please see to it that your library subscribes. The Bulletin should be considered for your publications, especially since the publication time is only four months after completion of acceptance by the reviewers and the editor.

Special mention should be made of the valuable contribution by the Archivist this year. Her work in organizing and settling the archives in the special collections library at Emory University will be invaluable as the ASB history is written for the anniversary annual meeting. Members are encouraged to contribute materials to this project.

Perhaps there should be a retrospective as well as a perspective report from

the President. Anyone reviewing the two previous “*Views from Here*” columns will realize how much we owe the former presidents and other officers as we look ahead to a busy 1982–83.

—Margaret L. Gilbert, President

ASB OFFICERS, COMMITTEES, AND REPRESENTATIVES 1982–1983

President—Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802 (813/683-5521 ext. 323).

President-Elect—Charles E. Jenner, Zoology, University of North Carolina, Chapel Hill, NC 27514 (919/962-2211).

Vice-President—J. Kenneth Shull, Jr., Biology, Loyola University, New Orleans, LA 70118 (504/865-2769).

Retiring President—J. Frank McCormick, Graduate Program in Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065).

Secretary—Rebecca R. Sharitz (1985), Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801 (803/450-6211).

Treasurer—J. Charles O’Kelley (1983), Biology, University of Alabama, University, AL 35846 (205/348-5960).

Executive Committee Members-at-Large—Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132 (615/898-2809); James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223 (704/597-2315); Lafayette Frederick (1984), Botany, Howard University, Washington, D.C. 20059 (202/636-6929); Sharon Patton (1984), Pathobiology, University of Tennessee, Knoxville, TN 37916 (615/546-9230 ext. 339); William C. Grant (1985), Zoology, North Carolina State University, Raleigh, NC 27650 (919/737-2011); Paul Yokley, Jr. (1985), Biology, University of North Alabama, Florence, AL 35630 (205/766-4100 ext. 437).

Auditing Committee—Chairman: Robert R. Haynes (1983), Biology, University of Alabama, University, AL 35486 (205/348-5960); Harriet E. Smith (1983) and Temd R. Deason (1983), also Biology, University of Alabama.

Conservation Committee—Chairman: Douglas A. Rayner (1983), South Carolina Wildlife and Marine Resources, Columbia, SC 29202 (803/758-6314); Diane Wagner-Merner (1984), Biology, University of South Florida, Tampa, FL 33620 (813/974-2011); Robert D. Sutter, Plant Conservation Program, N. C. Dept. of Agriculture, P. O. Box 27647, Raleigh, NC 27611 (919/733-3610).

Local Arrangements Committee for 1983—Chairman: James F. Jackson, Biology, University of Southwestern Louisiana, Lafayette, LA 70504 (318/231-6756).

Program Chairman for 1983—Victoria I. Sullivan, Biology, University of Southwestern Louisiana, Lafayette, LA 70504 (318/231-6987).

Meritorious Teaching Award Committee—Chairman: Beryl Franklin (1983), Biology, Northeast Louisiana University, Monroe, LA 71201 (318/342-3103); Sandra T. Bowden (1984), Biology, Agnes Scott College, Decatur, GA 33030 (404/373-2571); Steve C. Dial (1985), Biology, Pfeiffer College, Misenheimer, NC 28109 (704/463-7343 ext. 275).

Nominating Committee for 1983—Chairman: Franklin F. Flint, Biology, Randolph-Macon Woman's College, Lynchburg, VA 24503 (804/846-7892); George S. Ramseur, Biology, University of the South, Sewanee, TN 37375 (615/598-5931 ext. 304); Leland Shanor, Botany, University of Florida, Gainesville, FL 32611 (904/392-1891).

Past-President's Council for 1983—Chairman: J. Frank McCormick, Graduate Program in Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065).

Place of Meeting Committee—Chairman: Bill Murdy (1983), Biology, Emory University, Atlanta, GA 30322 (404/329-4211); Cletus Sellers (1984), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6652); A. Floyd Scott (1985), Biology, Austin Peay State University, Clarksville, TN 37040 (615/648-7781).

Priorities in Public Affairs—Lafayette Frederick, Botany, Howard University, Washington, D.C. 20059 (202/636-6929).

Research Awards Committee—Co-Chairmen: Diane Nelson (1983), Biology, East Tennessee State University, Johnson City, TN 37601 (615/929-4329) and Diane O. Flemming (1983), Biology, Wright State University, Dayton, OH 45431 (513/873-2310); James D. Caponetti (1984), Botany, University of Tennessee, Knoxville, TN 37916 (615/974-2256); David Husband (1984), Biology, University of South Carolina, Columbia, SC 29208 (803/777-4255); Phillip A. Robertson (1985), Biology, Southern Illinois University, Carbondale, IL 62901 (618/536-2331); Donald C. Tarter (1985), Biology, Marshall University, Huntington, WV 25701 (304/696-3148).

Resolutions Committee—Chairman: J. Frank McCormick, Graduate Program in Ecology, University of Tennessee, Knoxville, TN 37916 (615/974-3065); Victoria I. Sullivan, Biology, University of Southwestern Louisiana, Lafayette, LA 70504 (318/231-6987); Lawrence J. Davenport, Biology, University of Alabama, University, AL 35486 (205/348-5960).

Student Travel Award Committee—Chairman: Jack Davis (1983), Biology, James Madison University, Harrisonburg, VA 22801 (703/433-6225); Hazel Delcourt (1984), Botany, University of Tennessee, Knoxville, TN 37916 (615/974-2256); Ronald V. Dimock, Jr. (1985), Biology, Wake Forest University, Winston-Salem, NC 27109 (919/761-5000).

Editor, ASB Bulletin—James W. Hardin (1983), Botany, North Carolina State University, Raleigh, NC 27650 (919/737-2226 or 2727).

Editor, News and Notes—Jon R. Fortman (1984), Biology, Mississippi University for Women, Columbus, MS 39701 (601/382-0812).

Archivist—Madeline P. Burbank, Box 15134, Atlanta, GA 30333 (404/373-1413).

AAAS Representative (Section G)—Lafayette Frederick, Botany, Howard University, Washington, D.C. 20059 (202/636-6929).

MERITORIOUS TEACHING AWARD 1983

CALL FOR NOMINATIONS

It is not too early to be considering those (or perhaps only one, in many cases) whom you would like to nominate for this prestigious award. The ASB recognizes the importance of contributions by students of excellent teachers.

As part of the selection process for this Award, we plan to publish in the Bulletin the names of all who are nominated. The final selection will be announced at the 1983 April meeting.

Please take a moment to consider for nomination someone you feel is worthy of this Award. Nominees should be ASB members, active or recently retired. Watch for additional information in subsequent Bulletins. See the "Call-for-Papers" for nomination form. Send nominations to:

Dr. Beryl Franklin
Department of Biology—NLU
Monroe, LA 71209

News of Biology in the Southeast

Jon R. Fortman—*News Editor*
Department of Biological Sciences
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE AND PLACES

Florida

University of Florida, Department of Botany. *Dr. J. S. Davis*, Professor, is the organizer and coordinator of the Fourth Southeastern Phycological Colloquy, to be held at the University of Florida on October 22–24, 1982. *Dr. James Kimbrough*, Professor, has been appointed to the Sub-panel in Systematic Biology of the National Science Foundation.

University of West Florida, Department of Biology. *Dr. Shakti Unny* has recently received her Ph.D. from the University of Southern Mississippi, and has been hired as an Assistant Professor of Biology, where she will assume the directorship of the Medical Technology program.

Florida Southern College, Division of Science. *Mr. Charles F. Eickenberg* will retire in August, 1982 after 25 years of service to the College, teaching General Biology, Microbiology, and Parasitology, and supervising the Medical Technology Program.

University of Central Florida, Department of Biological Science. *Dr. Franklin F. Snelson* has been appointed Chairman of the Department replacing *Dr. David H. Vickers*, who has returned to full-time teaching after a one semester leave of absence.

Eckerd College, Collegium of Natural Sciences. *Dr. Sheila D. Hanes*, Assistant Professor of Biology, was the recipient of a NSF grant for the purchase of a SEM primarily for her work with paleozoic lycopods.

Illinois

Eastern Illinois University, Division of Life Sciences. *Dr. William W. Scott*, Professor of Biology, presided at the Annual Meeting of the Association of College Honor Societies held February 25–28 in New Orleans, Louisiana. *Dr. Scott* serves as Executive-Secretary-Treasurer of the Phi Sigma Biological Honor Society. He was reelected for a second term as President of the ACHS.

Louisiana

Northwestern State University, Department of Biological Sciences. *Dr. R. K. Baumgardner*, former Department Head, has returned to the classroom and his position has been assumed by *Dr. Thomas A. Burns*. *Dr. Burns* has been a faculty member since 1968, following his Ph.D. work at Arizona State University. His primary research interests are in the fields of Comparative Vertebrate and Environmental Physiology.

University of Southwestern Louisiana, Department of Biology. The Louisiana Board of Regents, at its meeting on April 22, 1982, formally approved a new Ph.D. program in environmental and evolutionary biology. Persons interested in this program should contact *Dr. Victoria I. Sullivan*, Department of Biology, University of Southwestern Louisiana, Lafayette, LA 70560 (318 231-6748).

Louisiana State University, Department of Botany. *Dr. Charles A. Schexnayder*, Professor of Botany and former Chairman of the Department, has been appointed Director of International Programs for the Center for Agricultural Sciences and Rural Development at LSU in Baton Rouge. *Dr. Shirley C. Tucker* has been appointed a Boyd Professor, one of ten on campus. She is the first woman to receive this honor at LSU. *Dr. Tucker* is currently Acting Chairman of the Department. *Dr. G. Michael W.*

Adams, Assistant Professor of Botany, will spend the summer at the Bigelow Laboratories in W. Booth Bay Harbor, Maine.

Mississippi

Gulf Coast Research Laboratory, Ocean Springs. "Guide to Common Tidal Marsh Invertebrates of the Northeastern Gulf of Mexico," written by *Dr. Richard Heard*, was published in February. The handbook contains 82 pages (8½" × 11") of species descriptions, scientific names in Latin, common names, synonyms, recognition characters, distribution and habitat information, literature references, taxonomic keys to selected groups, a glossary, and an index. Over 90 different kinds of invertebrates are treated in this guide. Line and halftone drawings by *Linda B. Lutz* are included in the handbook as well as several black-and-white photographs and color photographs of eight species of fiddler crabs. Limited copies are available to educators and those persons with recognized interests in the subject matter. Written requests for single copies may be sent to the Mississippi/Alabama Sea Grant Consortium, Ocean Springs, MS 39564. New college level marine science courses will be offered during the 1982 summer teaching session according to *Dr. David W. Cook*, registrar. Four of the new courses—Coastal Marine Geology, Oceanography I, Coastal Vegetation, and Comparative Histology of Marine Organisms—are to be taught during the first term, May 31–July 9. The other new course, Fauna and Faunistic Ecology of Tidal Marshes, will be offered in the second term, July 12–August 20. *Dr. Ervin Otvos*, Head of the Laboratory geology section, has been selected for inclusion in the 3rd Annual Edition of *Who's Who in Technology Today*.

North Carolina

North Carolina State University, Department of Horticultural Science. *Dr. Katharine B. Perry* was promoted from Extension Specialist to Assistant Professor. *Mrs. Elaine "Tracy" Segner* has been appointed Instructor in landscape horticulture. *Mr. Robert B. Belding* has been appointed Ag. Research Tech. I, and will conduct research on apples with *Dr. Eric Young*. *Mr. Bryce Lane*, a new Instructor in home horticulture and landscape maintenance, was awarded the International Plant Propagator's Society (Eastern Region) graduate student paper award. *Dr. Tom J. Monaco* and *Dr. D. Mason Pharr* were among five NCSU faculty admitted to Gamma Sigma Delta. *Miss Julie Edwards*, Masters Candidate, was awarded one of the 1982 Outstanding Graduate Teaching Assistant Awards.

Warren Wilson College, Biology Department. *Dr. Sydney Craig III* has been appointed to the Biology staff. He was formerly with the Biology Department at the University of Southwestern Louisiana and is well known for his research on regulation of DNA and RNA synthesis.

Highlands Biological Station. The Station is sponsoring a Decennial Conference on Plethodontid Salamanders on August 7–10, 1982, which will focus on current research on all aspects of the biology of this important group of salamanders. The Conference will include nineteen invited papers, as well as three discussion sessions on research problems now being actively investigated. For information contact Executive Director, Highlands Biological Station, P.O. Box 580, Highlands, NC 28741.

North Carolina State University, Botany Department. *Dr. Jon M. Stucky*, with assistance from *Drs. Tom Monaco* and *A. D. Worsham*, received a Superior Award in the Communications Critique and Awards Program conducted by the Agricultural Communicators in Education on their publication "Identifying Seedling and Mature Weeds Common in the Southeastern United States."

University of North Carolina–Wilmington, Department of Biology. In May 1982 the University of North Carolina at Wilmington will graduate its first students with a Masters degree in Marine biology. The Marine Biology Graduate Program was implemented on the Wilmington campus in the Fall of 1980.

South Carolina

Presbyterian College, Department of Biology. *Dr. John C. Inman* has been appointed Chairman of the Department of Biology where he has taught since 1980. *Dr. Inman* has his Ph.D. in Soil Biochemistry from Purdue University and came to Presbyterian College from the Agronomy Department of the University of Maryland.

University of South Carolina, Department of Biology. *Dr. Lewis H. Bowman* of Washington University School of Medicine has accepted a position of Assistant Professor in the department beginning in the Fall of 1982. *Dr. W. T. Batson*, Professor of Biology, will retire at the end of the academic

year. Dr. Batson has served diligently and in distinguished fashion, the students at the University, the Department of Biology, and the State of South Carolina for 30 years. He received both his M.A. and Ph.D. degrees in Botany from Duke University. He began his long career at the University of South Carolina as an Assistant Professor in 1952. He became a full Professor in 1960. His publications include 41 articles and abstracts in addition to 3 books including "Wildflowers of South Carolina." The Biology majors of the future, and the Biology Department at the University will miss the efforts of this faculty member whose laboratory is the Biosphere.

Virginia

College of William and Mary, Department of Biology. *Dr. Stewart Ware* has completed two 3-year terms as Chairman of the Department and will return to full time teaching and research. He will be succeeded by *Dr. Lawrence L. Wiseman*. Dr. Ware has just been reappointed as editor of the Virginia Journal of Science after completing three years in that post. This is the quarterly journal of the Virginia Academy of Science.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Florida

The Marie Selby Botanical Gardens. A new orchid species has been discovered by *Libby (Mrs. Byron) Besse*, a Sarasota resident since 1969, and plant recorder for Selby Gardens since 1976. The rare new species is a lady slipper and has been named *Phragmipedium besseae* Dodson & Kuhn in recognition of its discoverer. Orchid experts have placed a minimum value of \$1500 on each new plant. Mrs. Besse made the find in the crevice of a wet stone cliff near Tarapota, Peru, in the eastern Andes while on a recent plant-hunting expedition with a group of seven other experienced collectors. Three of the orchids will be for sale at the Gardens' annual Orchid Auction on March 20, 1982.

Georgia

Callaway Gardens has announced plans for a new indoor-outdoor garden complex featuring some of the most innovative methods of greenhouse design in the world. When completed, the complex will encompass five acres and will consist of five steel-framed structures with removable roofs and sliding wall panels. Seven gardens can be viewed from walkways which will be covered during inclement weather. The dramatic structure will have the atmosphere of a trellised garden and the new complex will be attuned to the Southern climate.

Savannah Science Museum, Inc. *Gerald K. Williamson*, Research Director at the museum since 1972, has been named Director of the museum. Williamson established the museum's Herpetological Collection in 1968 and its Caretta Research Project in 1972. The Herpetological Collection currently comprises 28,000 specimens and is one of the most extensive in the Southeast. *Charles W. Seyle, Jr.*, Research Associate, has been elected Co-chairperson of The Gopher Tortoise Council for 1982-83. Biologists concerned with the decline in numbers of gopher tortoises throughout much of their range in the Southeast formed the council in 1978 to combat this decline. Persons desiring more information about this Council and its aims should contact Richard Franz at the Florida State Museum, Gainesville, Florida 32611.

Kentucky

The Kentucky Museum has recently reopened its doors after a three-year renovation and expansion program. The new facility includes increased gallery space, orientation area, lecture hall, reception room, museum store, children's activity room, and tiered garden. Regular tour programs are available, as well as special exhibits and educational programs.

Mississippi

The Mississippi Museum of Natural Science has completed a new exhibit program, "Mississippi's Web of Life." Educational exhibits, dioramas, and aquaria combine to tell the ecological story of

Mississippi. Three new members have recently been added to the staff. *Dr. Eleanor Daly*, vertebrate paleontologist, received her Ph.D. from the University of Kansas at Lawrence. Her research there dealt with Paleozoic amphibians. *Dr. Robert Jones*, Natural Heritage Program zoologist, received his Ph.D. from the University of Tennessee. *Seth Mott*, also with the Natural Heritage Program, has recently completed his M.S. in Wildlife Ecology at Mississippi State University.

North Carolina

North Carolina State Museum of Natural History. Preparations are proceeding smoothly for the combined 25th Anniversary Meeting of the Society for the Study of Amphibians and Reptiles and 30th Annual Meeting of the Herpetologists' League. The meeting, hosted by the museum, will be held during the period 1–6 August 1982, in Raleigh. Featured will be a special SSAR Silver Anniversary Symposium, "Molecular and Genomic Evolution of Amphibians and Reptiles," organized by *Dr. David B. Wake*. For additional information contact *Ray E. Ashton*, NCSM, Box 27647, Raleigh, NC 27611. *Dr. Gilbert S. Grant* has joined the Research and Collections Section staff as preparator in the Department of Birds and Mammals. *Dr. Grant* received his Ph.D. in behavioral and physiological ecology from UCLA. *Handbook of Reptiles and Amphibians of Florida, Part I: The Snakes*, written by Director of Education *Ray E. Ashton, Jr.*, and Associate Curator *Patricia Sawyer Ashton*, has been published by Windward Publishing Co., Miami. *Will Thomson*, exhibits preparator, has left the museum to become exhibit designer/museum instructor at the Museum of Natural History, University of Iowa, Iowa City. *Dr. John E. Cooper* has stepped down as Deputy Director of the museum, and has been replaced by *David S. Lee*. *Brimleyana*, the refereed regional journal of the NCSM, is encountering financial difficulties. The journal limits its coverage to zoology and paleontology of the Southeast. For subscription information contact *Alexa Williams*, Managing Editor, N.C. State Museum, P.O. Box 27647, Raleigh, NC 27611.

MISCELLANEOUS

Dr. John Cairns, Jr., University Distinguished Professor of Biology and Director of the University Center for Environmental Studies at Virginia Polytechnic Institute and State University, and *Dr. Eugene Odum*, Alumni Foundation Distinguished Professor of Zoology and Director of the Institute of Ecology at the University of Georgia, were recently honored with Founders' Awards at the Second Annual Meeting of the Society of Environmental Toxicology and Chemistry. Both scientists are renowned for their research and contributions to the field. *Dr. Cairns*, a specialist in fresh water ecology and aquatic toxicology, received a Presidential Commendation in 1971 and the ASTM Dudley Award in 1978. *Dr. Odum*, a member of the National Academy of Science, is noted for his classic text in ecology and for his work in ecosystem productivity and population energy flow. *Dr. Odum* has previously received the AIBS Distinguished Service Award and the Mercer Award in ecology.

Dr. Clyde Keeler, Professor of Biology Emeritus at Georgia College, has been recognized in a number of areas for his outstanding contribution to biological research. The Harvard Magazine reports the following story. While a student at Harvard in 1925, *Dr. Keeler* made some drawings of fungi in the laboratory of Professor Weston. After the course was finished, *Dr. Weston* asked permission to keep the drawings to "goad future students." The drawings found their way into the library of the Farlow Herbarium, and are still being used as a model for students of algae and fungi. In Volume XVI of the March of Dimes Publication "Birth Defects: Original Article Series 1980," *Dr. Keeler* is given special credit for being one of the "grandfathers" of dental genetics. In 1935, *Dr. Keeler* compiled 52 kindreds of dental defects from the literature and from patients he saw at Tufts and Harvard Schools of Dentistry. The classic paper documented autosomal dominant inheritance of numerous dental traits. He published his first paper in dental genetics in 1924 and the last in 1973, spanning the modern historical period of the discipline. Finally, *Dr. Keeler* was honored by the Association for Research in Vision and Ophthalmology at its annual meeting last May, for his discovery of retinal degeneration in rodents. In 1947 and 1952, ASB awarded *Dr. Keeler* the annual prize for the best research paper.

Index of Current Plant Systematic and Ecological Research in the Southeastern United States. Published in the ASB Bulletin 28: 154–161, this list will be maintained as a card file and kept current by *Dr. James F. Matthews*, Department of Biology, University of North Carolina, Charlotte, NC 28223. Inquiries, updating, and new project titles should be sent to him.

The **Southern Regional Education Board** provides financial assistance, for using facilities not available locally, to faculty in the natural sciences in FL, KY, LA, NC, SC, and TN. The grants are usually between \$400 and \$750 and are designed to augment institutional support for research activities. For additional information, contact *Dr. E. C. Godbold*, SREB, 1340 Spring Street, N.W., Atlanta, GA 30309.



59.06

QH301
.A78
*

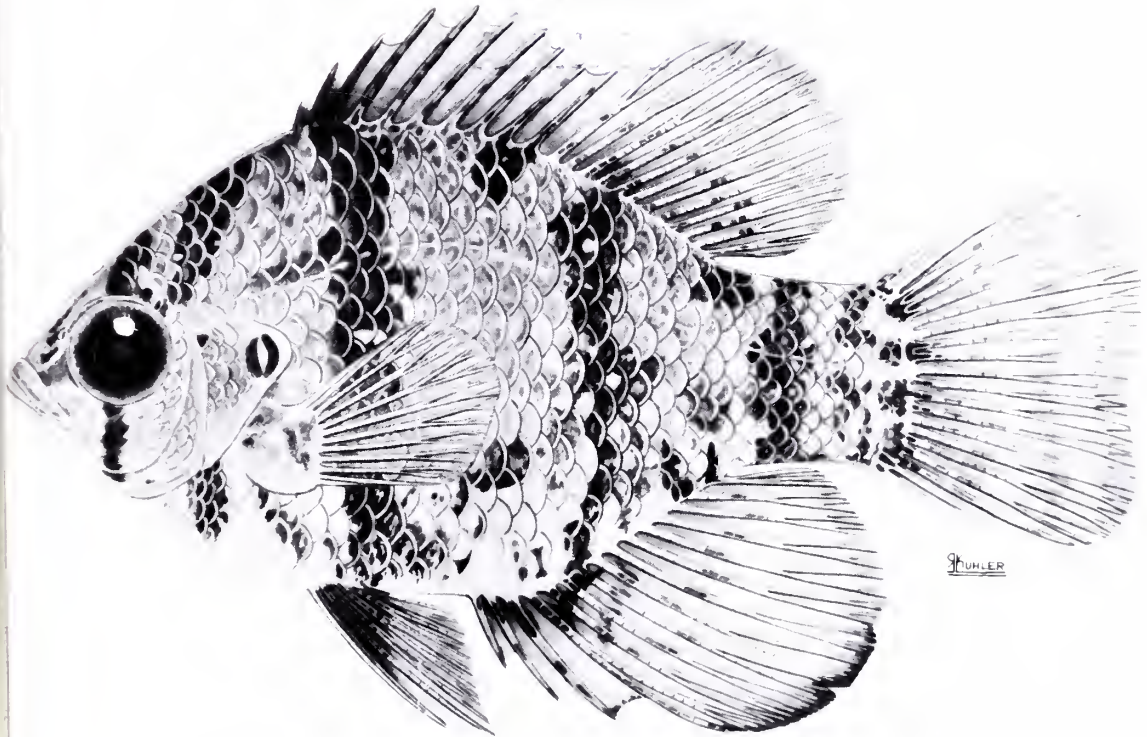
The ASB

BULLETIN

Volume 29, Number 4

October 1982

OCT 29 1982



Black-Banded Sunfish

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Lawrence, Kansas in January, April, July and October. Letters and other contributions, as well as all communications about editorial matters should be addressed to Dr. James W. Hardin, Department of Botany, North Carolina State University, Raleigh, NC 27650. News items should be sent to the News Editor, Dr. Jon Fortman, Department of Biological Sciences, Mississippi University for Women, Columbus, MS 39701. Inquiries about missing numbers and other circulation matters should be addressed to Ms. Dorothy Hubbard, Circulation Manager, The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103. Subscription orders from institutions should be sent to the Business Manager, Dr. J. C. O'Kelley, Department of Biology, University of Alabama, University, AL 35486. Subscription rate for non-members of the ASB: \$10.00 per year. Printing and typography by Allen Press, Inc., Lawrence, KS.

Second-class postage paid at Philadelphia, Pennsylvania, and additional mailing office.

JAMES W. HARDIN
EDITOR

REBECCA R. SHARITZ
Associate Editor

JON FORTMAN, News Editor
J. C. O'KELLEY, Business Manager
DOROTHY HUBBARD, Circulation Manager

OFFICERS OF THE ASB

President — Margaret L. Gilbert, Biology, Florida Southern College, Lakeland, FL 33802

Past President — J. Frank McCormick, Ecology, University of Tennessee, Knoxville, TN 37916

President Elect — Charles E. Jenner, Zoology, University of North Carolina, Chapel Hill, NC 27514

Vice-President — J. Kenneth Shull, Jr., Biology, Loyola University, New Orleans, LA 70118

Secretary — Rebecca R. Sharitz, Savannah River Ecology Laboratory, Aiken, SC 29801

Treasurer — J. C. O'Kelley, Biology, University of Alabama, University, AL 35486

Archivist — Madeline P. Burbanck, Box 15134, Atlanta, GA 30333

Executive Committee —
Mary C. Dunn (1983), Biology, Middle Tennessee State University, Murfreesboro, TN 37132

James F. Matthews (1983), Biology, University of North Carolina, Charlotte, NC 28223

Lafayette Frederick (1984), Botany, Howard University, Washington, DC 20059

Sharon Patton (1984), Veterinary Pathobiology, University of Tennessee, Knoxville, TN 37916

William C. Grant (1985), Zoology, North Carolina State University, Raleigh, NC 27650

Paul Yokley, Jr. (1985), Biology, North Alabama University, Florence, AL 35630

AAAS Representative, Section G —
Lafayette Frederick, Botany, Howard University, Washington, DC 20059



CONTENTS

Association Affairs	159
News of Biology in the Southeast	161

COVER

Adult of *Enneacanthus chaetodon* collected in Raccoon Pond, Sussex County, Delaware. This is one of 95 illustrations prepared by Renaldo G. Kuhler, North Carolina State Museum of Natural History, for a forthcoming book on the **Freshwater Fishes of Maryland and Delaware** by D. S. Lee, G. R. Gilbert, S. P. Platania, and A. Norden.

PATRON MEMBERS

Carolina Biological Supply Company, Burlington, NC
Parco Scientific Company, Vienna, OH
Fisher Scientific Company, Chicago, IL
Olinkraft, Incorporated, West Monroe, LA
Beckman Instruments, Incorporated, Norcross, GA
Martin Instrument Company, Greenville, SC

TIME AND PLACE OF FUTURE MEETINGS

1983	April 13-16	University of Southwestern Louisiana, Lafayette
1984	April 11-14	Memphis State University
1985		Middle Tennessee State University, Murfreesboro
1987		University of Georgia, Athens (50th Anniversary)

Association Affairs

FORTY-FOURTH ANNUAL MEETING UNIVERSITY OF SOUTHWESTERN LOUISIANA LAFAYETTE, LOUISIANA APRIL 13-16, 1983

PLAN NOW TO ATTEND!

1. See "**Call-for-Papers**" for the various deadlines.
2. A **Pre-registration form** will be in the January issue. Pre-registration will be especially advantageous in arranging lodging and parking. Pre-registration will also be at a reduced price.
3. **Lodging accommodations** for approximately 200 persons will be available in the Conference Center on the USL campus. Other persons will have to be lodged in motels two or more miles from campus. The administrators of the Conference Center have insisted that all reservations for lodging be processed through the Conference Center. Details will be in the January issue. Lodging at the Conference Center will be both less expensive and more convenient since the meetings will be held in the Center.
4. **On-campus parking** will be limited, and Lafayette's boom-town traffic is hectic. Consequently, recommendations from the Local Arrangements Committee regarding parking should be followed carefully. **On the plus side:** *the rooms for paper sessions in the Conference Center are commodious and close together for easy movement between sessions; the bar in the Conference Center is open for business 3:30-10:00 P.M.; and April is the middle of the crawfish eating season!*

NOMINATIONS

The Executive Committee of ASB discussed the possibility of having a postal ballot for the election of ASB officers. There was some feeling from the membership that this would involve a larger number of members in the selection of these officers. After some debate, it was decided that the election should be held at the business meeting of the annual ASB meeting. It is understood that not all members are able to attend the annual meeting, particularly the annual business meeting. All members could, however, have a part in the election process if they would send nominations and suggestions of people to serve in the various offices to the Nominating Committee. For the past several years, few nominations have been forthcoming from the membership. Therefore, we urge you to take an active part in the election of officers for ASB by writing the Nominating Committee. **Suggest people for office! Use this means to let your voice be heard! See "Call-for-Papers" for nomination form!**

MERITORIOUS TEACHING AWARD

In accordance with recommendations from the officers and members of the Executive Committee of the ASB, I am pleased to list the current candidates for the Meritorious Teaching Award for 1983. I have, on file, letters supporting the nominations of the following:

Burton J. Bogitsh, Vanderbilt University
Joe A. Chapman, Jefferson City, TN
Jerome A. Jackson, Mississippi State
James F. Matthews, UNC Charlotte
Robert H. Mohlenbrock, Southern Illinois University
John A. Patten, Middle Tennessee State University
Frederick T. Wolf, Vanderbilt University

If any member of the ASB would like to submit in nomination other outstanding teachers in the Southeast, please do so. If you would like to write in support of any of the above (and have not done so previously), please send your letter to: Dr. Beryl C. Franklin, Department of Biology, Northeast Louisiana University, Monroe, LA 71209. **The deadline is February 1.**

COPY DEADLINES

All materials for the Bulletins should be typed, double-spaced throughout, and in the hands of the Editor by the following dates:

September 25—January issue
November 25—April issue
April 25—July issue
June 25—October issue

News of Biology in the Southeast

JON R. FORTMAN—*News Editor*
Division of Science and Mathematics
Mississippi University for Women
Columbus, Mississippi 39701

ABOUT PEOPLE AND PLACES

Alabama

Auburn University, Department of Botany. In recognition of his 35 years of distinguished service to the University, the University Arboretum was renamed the *Donald E. Davis Arboretum* of Auburn University at a rededication ceremony, May 29, 1982. Davis retired July 31, 1982. Dr. Davis, a plant physiologist, served on the faculty since 1947, gaining an international reputation as a scientist and scholar.

Florida

University of Miami, Rosenstiel School of Marine and Atmospheric Science. Dr. Alan Berman, Director of Research of the U.S. Naval Research Laboratory, Washington, DC, has been named Dean of the School of Marine and Atmospheric Science, effective July 1, 1982. Dr. Berman succeeds Dr. Warren J. Wisby who has served as interim dean since June 1980 when Dr. William W. Hay resigned from the deanship to accept the presidency of the Joint Oceanographic Institutions, Inc., a scientific consortium in Washington, DC. Dr. Berman earned his bachelor's and doctoral degrees in physics from Columbia University. In September 1980, the President of the United States conferred upon Dr. Berman the rank of Distinguished Executive of the Senior Executive Service in recognition of his performance as Director of Research of the Naval Research Laboratory.

Rollins College, Department of Biology. Dr. Carl Sandstrom has retired from the Department. Dr. Steven Klemann is joining as a cell and developmental biologist.

Environmental Services Department, Sarasota. Dr. Jeff Lincer, who has been serving as National Secretary and Foreign Correspondent, is the newly elected President of the Raptor Research Foundation. Requests for information and/or membership applications should be sent to Dr. Lincer at 4718 Dunn Drive, Sarasota, FL 33583.

Georgia

Georgia Southern College, Department of Biology. Dr. Charles D. Michener, Professor of Entomology, Systematics, and Ecology at the University of Kansas delivered the 1982 LeConte Visiting Scholars lecture. He was presented a watercolor print of the LeConte Sparrow from Dr. James H. Oliver, Callaway Professor of Biology at Georgia Southern. The LeConte Visiting Scholars series brings distinguished scientists to the college to encourage further excellence in research and education in biology.

Kentucky

Murray State University, Department of Biological Sciences. Murray State's Hancock Biological Station and Land-Between-the-Lakes have been designated an experimental ecological reserve by the Institute for Ecology for the National Science Foundation. Joining the faculty this fall are: James M. Crum (Ph.D. University of Georgia), Veterinary Parasitology, Tom J. Timmons (Ph.D. Auburn University), Fisheries and Allied Aquacultures, and Stephen B. White (Ph.D. Ohio State University), Zoology.

University of Kentucky, Department of Forestry. The Department will host the Fourth Central Hardwood Forest Conference, November 9–10, 1982. The conference will include presentations from studies of community ecology, forest biomass and productivity, nutrient cycling and hydrology, silvics and silviculture, and intensive forest culture in the Central Hardwood Forest Region. For more information, contact: Robert N. Muller, Department of Forestry, University of Kentucky, Lexington, KY 40546. Phone: (606) 258-2780.

Louisiana

Louisiana State University, Baton Rouge, Department of Botany. *Dr. Clair A. Brown* died on March 24, 1982. Dr. Brown was Professor Emeritus of Botany at LSU. He was on the faculty since 1928 and until his retirement served as Curator of the LSU Herbarium. He served as President of the Louisiana Academy of Sciences and American Fern Society. He was Honorary President of the Société Botanique de France. His many publications and books include *Louisiana Trees and Shrubs*, *Mississippi Trees, Ferns and Fern Allies of Louisiana*, and *Wildflowers of Louisiana and Adjoining States*.

Northeast Louisiana University, Department of Biology. *Dr. Melinda L. Kinkade*, Head of the Department, has been appointed to the Louisiana State Planning Committee of the American Council on Education's National Identification Program for Women in Higher Education Administration. She will also serve as a member of the Executive Committee of the LSPC. The annual conference sponsored by the LSPC for Louisiana women administrators will be October 23–24 in Baton Rouge. This year's theme is "Women of Power." Dr. Kinkade is one of only two scientists on the committee of 15 women.

University of Southwestern Louisiana, Department of Biology. *Dr. Robert G. Jaeger* assumed the post of Senior Editor of the Journal, *Herpetologica*, on 1 January 1982. *Dr. Steven C. Hand*, Assistant Professor of Biology, participated as a research scientist aboard the R/V *Melville* for the April, 1982 cruise to the hydrothermal vents in the eastern Pacific. Dr. Hand's work there concerned physiological adaptations of hydrothermal invertebrates with emphasis on the hydrothermal vent crabs.

Mississippi

Mississippi State University, Department of Biological Sciences. The Graduate Studies Lecture Series for the 1981–82 academic year included *Dr. Jerry B. Hook* from Michigan State University, *Dr. Toshio Narahashi* from Chicago, IL, *Dr. James R. Gillette* from Washington, DC, and *Dr. Melvin Calvin* from Berkeley, CA. *Dr. Romm Altig* was voted outstanding professor of the Honors Program at the University. *Dr. Armando de la Cruz* has been appointed to the Editorial Board of *Wetlands*, Journal of the Society of Wetland Scientists. He will also continue to serve in 1982 on the Editorial Board of *Northeast Gulf Science*, a publication of the Marine Sciences Consortium of Alabama. *Dr. Janice Chambers* co-organized a 2-day symposium "Analytical and Toxicological Significance of Pesticide Metabolites" which was presented to the Division of Pesticide Chemistry at the American Chemical Society meeting this past March. *Dr. Jerome Jackson* has been re-elected as editor of the *Journal of Field Ornithology*.

Gulf Coast Research Laboratory, Ocean Springs. *Dr. Sally L. Richardson*, associate ichthyologist at the Laboratory has been named to a steering committee that will plan an international symposium and edit a publication resulting from the symposium. The book will be entitled "Ontogeny and Systematics of Fishes—A Memorial Volume Dedicated to Elbert Halvor Ahlstrom." In addition, Dr. Richardson has been designated to oversee the preparation of scientific illustrations for the publication. *Dr. Lionel N. Eleuterius*, Head of the Botany Section, has found *Halesia diptera*, a rare shrub of south Mississippi which reaches tree size (30' in height), on the laboratory grounds in Ocean Springs.

Mississippi University for Women, Division of Science and Mathematics. *Dr. Harry L. Sherman* has been promoted to Head of the Division of Science and Mathematics. He formerly served as Chairman of the Department of Biological Sciences. *Dr. Preston McKee* has been promoted to the rank of Associate Professor of Biology. *Dr. James Murrell* has been promoted to Vice President for Academic Affairs. Dr. Murrell served in the Biology Department as an Associate Professor and taught advanced courses in cell biology and botany.

North Carolina

University of North Carolina at Charlotte, Department of Biology. On June 1, the University of North Carolina at Charlotte and the Chimney Rock Company dedicated the *Hickory Nut Gorge Field Station*. The field station is a cooperative venture between the University and the Company. It is to be used for interpretive research on the biological and cultural aspects of the area of North Carolina in and around the Hickory Nut Gorge. *Dr. Thomas Reynolds* (Ph.D. Ohio State University) has joined the faculty, and will be responsible for teaching plant physiology and plant growth and development courses. His research interests are in plant cell culture and ultrastructure.

University of North Carolina at Wilmington, Department of Biology. The 80 ft. RV *Seahawk* was christened in May 1982. The primary research function of the vessel is to serve as a base for diver-oriented research including research involving diving bells and submersibles. The vessel is for use by the UNC-W faculty and students and is available to other scientists through the NOAA-sponsored SURF Program. For more information, contact: Dr. Gilbert W. Bane, SURF, UNC-W, Wilmington, NC 28406.

North Carolina State University, Department of Horticultural Science. *Dr. Douglas C. Sanders*, extension and research on cultural practices of processing vegetables, was recently promoted to Professor. The following faculty were promoted to Associate Professor with permanent tenure: *Dr. Ted C. Bilderback*, *Dr. William C. Fonteno*, and *Dr. Randolph G. Gardner*. New Agricultural Research Technicians include: *Mr. Kenneth W. Stoll* and *Mr. Bill Foster*. *Dr. L. George Wilson* will be on an AID assignment in Peru for one year beginning July, 1982. *Dr. J. Mike Cannon* will be a Visiting Extension Specialist working with the extension sweet potato and Irish potatoes while *Dr. Wilson* is on leave.

North Carolina State University, Department of Zoology. *Dr. Larry B. Crowder* has been appointed as an Assistant Professor of Zoology. He will teach and conduct research in fisheries science. *Dr. Harriet M. Ammann* and *Dr. Samuel I. Zeveloff* have been appointed Visiting Assistant Professors. *Dr. Grover C. Miller* has been appointed Coordinator of Graduate and Undergraduate Activities for the Department. *Dr. William C. Grant* and *Dr. Charles F. Lytle* have been elected as "Outstanding Teachers" at NCSU.

North Carolina State University, Department of Botany. *Dr. Ernest D. Seneca* was named one of ten professional conservationists to receive a Gulf Oil Conservation Award for 1982. *Dr. Robert L. Beckmann* has been elected as an "Outstanding Teacher" at NCSU.

Highlands Biological Station. A grant-in-aid program is announced for 1983 to support meritorious research in field biology in the southern Appalachians. Awards will be made to both graduate students and senior (postdoctoral) investigators. Preference in awarding grants is given to projects involving residency at the Station. For further information write Executive Director, Highlands Biological Station, P.O. Box 580, Highlands, NC 28741.

University of North Carolina at Chapel Hill. On July 1, 1982 the Department of Botany and the Department of Zoology were combined into a Department of Biology. *Dr. Larry I. Gilbert*, zoologist, is Chairman; *Dr. Robert K. Peet*, botanist, and *Dr. Alan Feduccia*, zoologist, are Associate Chairmen.

South Carolina

University of South Carolina Herbarium. *Dr. Wade Batson, Jr.*, retired this past summer, and many of his friends and former students are working toward establishing a fellowship in botany in his honor. Tax deductible contributions may be sent to Dr. T. L. Wimer, Chairman, Department of Biology, University of South Carolina, Columbia, SC 29208. Checks should be made payable to USC Educational Fund. For further information contact S. M. Siddiqi, Department of Life Sciences, Virginia State University, Petersburg, VA 28203.

Virginia

Old Dominion University, Department of Biological Sciences. *Dr. Alan Savitzky*, presently a Lecturer in Biology in the Section of Ecology and Systematics at Cornell University, will join the faculty this fall.

Washington and Lee University, Department of Biology. The Department is pleased to announce the appointment of *Dr. Peter Bergstrom* as Assistant Professor of Biology. *Dr. Bergstrom* is a graduate of the University of Chicago and will occupy the position created by the untimely death of *Dr. Gary H. Dobbs, III*.

West Virginia

West Virginia University, Department of Biology. *Dr. Martin W. Schein*, Chairman of the Department, has received a Fulbright Scholarship and will spend the 1982–83 academic year in India. *Dr. Roy B. Clarkson*, will be acting chairman during his absence. *Dr. James B. McGraw*, presently a graduate student at Duke University, has accepted a one-year appointment.

ABOUT MUSEUMS AND BOTANICAL GARDENS

Florida

The Marie Selby Botanical Gardens, Sarasota. The National Science Foundation has awarded a grant of \$84,000 to support Research Director *Dr. Calaway Dodson's* studies on the plant life of Ecuador. In making the grant, the NSF recognizes the urgency of Dr. Dodson's floristic research as vast tracts of botanically unexplored land are being cleared for "civilization" at a speed which could mean the total destruction of tropical forests worldwide in less than 30 years. The loss of their flora to scientific research, in the field of medicine for example, is immeasurable.

Mississippi

Mississippi Museum of Natural Science, Jackson. The Museum has received notice that it has become accredited by the American Association of Museums. The American Association of Museums is a national organization with some 7000 members. Of the more than 5000 museums in the United States, only 496 meet standards set by the AAM.

North Carolina

North Carolina State University Arboretum. The 1981–82 fiscal year was an important developmental one for the young NCSU Arboretum. The Japanese Garden site was graded to its final form and plantings begun, including four large specimen plants of 8–20' tall to give the garden some "age and character." On June 6, 1982, the formal dedication of the Southall Memorial Garden took place in honor of Col. Russell Southall, teacher of plant material at NCSU from 1966 to 1978, who died of brain cancer in 1979. The NCSU arboretum is under the direction of Dr. J. C. Raulston.



AMNH LIBRARY



100001336